Adaptive Server® Enterprise
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Installation Guide for Linux

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1 Installation Guide for Linux

SAP® Adaptive Server® Enterprise is a high-performance relational database management system for mission-critical, data-intensive environments. It ensures highest operational efficiency and throughput on a broad range of platforms.

This installation guide includes information on system requirements, planning the installation, installing SAP® ASE, post-installation tasks, upgrades, and downgrades.

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2 Conventions

These style and syntax conventions are used in SAP® Adaptive Server® Enterprise (SAP® ASE) documentation.

- In a sample window display, commands to be entered exactly as shown appear in:

  ```
  this font
  ```

- In a sample window display, words that you should replace with the appropriate value for your installation are shown in:

  ```
  <this font>
  ```

- In the regular text of this document, the names of files and directories appear in this font: `/usr/u/home_dir`.
- The names of programs, utilities, procedures, and commands appear in this font: `sqlupgrade`.
- Commands for both the C shell and the Bourne shell are provided, when they differ. The initialization file for the C shell is called `.cshrc`. The initialization file for the Bourne shell is called `.profile`. If you are using a different shell, such as the Korn shell, refer to your shell-specific documentation for the correct command syntax.

Table 1: SQL Syntax Conventions

Key	Definition
`command`	Command names, command option names, utility names, utility flags, and other key-words are in a bold san-serif font.
<variable >	Variables, or words that stand for values that you fill in, are in *italic*.
`{ }`	Curly braces indicate that you choose at least one of the enclosed options. Do not include braces in your option.
`[ ]`	Brackets mean choosing one or more of the enclosed options is optional. Do not include brackets in your option.
`( )`	() are to be typed as part of the command.
`|`	The vertical bar means you can select only one of the options shown.
`,`	The comma means you can choose as many of the options shown as you like, separating your choices with commas, which are typed as part of the command.

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3 Installation Task Overview

To successfully install and configure SAP ASE, use the configuration guide along with this installation guide.

The SAP ASE installation guide explains how to unload the SAP ASE software from the distribution media to your hard disk, and perform the minimal set of additional tasks so that you can start SAP ASE on your machine.

The configuration guide provides instructions for:

- Reconfiguring certain attributes of your existing SAP ASE, Backup Server™, and XP Server™ to meet your specific needs.
- Creating network connections.
- Configuring optional functionality.
- Performing operating system administrative tasks.
- Working with system administration issues that are relevant to SAP ASE running on UNIX platforms. This manual supplements the *System Administration Guide* and the *Performance and Tuning Series*.

3.1 Installation Workflows

Workflows define a complete path for planning, installing, and upgrading.

Whether you plan to install or upgrade SAP ASE, identify the components and options to install or upgrade, and obtain a license.

Installing SAP ASE for the First Time

1. Plan your installation and review system requirements.
2. Install SAP ASE.
3. Perform postinstallation tasks.

Upgrading to a New Version of SAP ASE

1. Determine your upgrade eligibility, plan your installation, and review system requirements.
2. Run the `preupgrade` utility to prepare SAP ASE for upgrading.
3. Upgrade SAP ASE.
4. Perform postinstallation (postupgrade) tasks.

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Uninstalling SAP ASE

See *Uninstalling SAP ASE*.

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4 SAP ASE Components

SAP ASE is based on a client/server model, communicating with its clients over the network via the Tabular Data Stream™ (TDS) protocol. Each client process may execute on one machine and communicate with a database server on the same or a different machine.

SAP ASE runs as an application on top of an operating system. The hardware that the operating system runs on is completely transparent to SAP ASE, which sees only the operating system's user interfaces. To enhance performance on multiprocessor systems, configure multiple processes (engines).

SAP ASE is divided into a DBMS component and a kernel component. The kernel component uses the operating system services for process creation and manipulation, device and file processing, and interprocess communication. The DBMS component manages SQL statement processing, accesses data in a database, and manages different types of server resources.

4.1 SAP ASE Editions

Analyze your system and scalability requirements to determine which edition of SAP ASE is appropriate for your enterprise.

- Enterprise edition – has no limit on scalability and supports all of the options that can be purchased or licensed separately.
- Small business edition – has limited scalability, and supports a limited set of the options that are purchased or licensed separately.
- Developer edition – has limited scalability and includes many of the options that are included in the enterprise edition.

See the *SySAM Users Guide* for information about unlocking editions and optional features.

The SAP ASE installer automatically installs a SySAM license server if you choose the full installation option or enter a served license when prompted for the SySAM license key. You can also install the license server using the installer's custom installation option. See the *SySAM Users Guide* to generate licenses.

4.1.1 Determining the Edition You Have

If you already use SAP ASE, use the `sp_lmconfig` system procedure to identify the version.

Procedure

Enter:

```
sp_lmconfig 'edition'
```


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SAP ASE returns a value of `EE`, `SE`, or `DE` based on the edition that is currently running. See the *Reference Manual* for more information about `sp_lmconfig`.

4.2 SAP ASE Options

SAP offers various optional features for SAP ASE, such as data compression, partitions, and encrypted columns.

Option	Description
Data compression	Enables compression for regular and large object data, which uses less storage space for the same amount of data, reduces cache memory consumption, and improves performance due to lower I/O demands.
Security and directory services	Provides lightweight directory services and network-based authentication and encryption using SSL and Kerberos.
Partitions	Enables semantic partitioning for table row data.
Encrypted columns	Increases security parameters and allows for addition of datatypes.
Tivoli storage manager	Enables the database to back up and restore operations to IBM Tivoli Storage Manager.
In-memory database	Provides zero-disk-footprint in-memory database support that is fully integrated with SAP ASE for high-performance transactional applications. Provides performance enhancements to disk-resident databases with relaxed durability properties.

SAP ASE editions and optional features are unlocked by SySAM licenses. See the *SySAM Users Guide*.

To install any of these optional features to an existing SAP ASE installation, use the same steps as you used to install SAP ASE.

4.3 Managing SAP ASE with SAP Control Center

SAP® Control Center (SCC) provides a single, comprehensive, Web-administration console for real-time performance, status, and availability monitoring of large-scale SAP enterprise servers.

SAP Control Center combines a modular architecture, a rich-client administrative console, agents, common services, and tools for managing and controlling SAP products. It includes historical monitoring, threshold-based alerts and notifications, alert-based script execution, and intelligent tools for identifying performance and usage trends.

The SAP ASE installer installs these SAP Control Center components:

- Remote Command and Control Agent for SAP ASE – a remote command and control agent that runs on a managed server, and which is required to manage SAP ASE tasks within SCC.
- SNMP support for SAP ASE – Simple Network Management Protocol is a standard protocol used for network management. SNMP allows managers and agents to communicate: managers send requests to agents, and agents respond to queries from managers.

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In addition, you must also install the SCC Management User Interface for SAP ASE in the custom installation option by selecting the *SAP Control Center Management User Interface for SAP ASE* feature. This feature provides the GUI that allows you to manage and monitor activities in SAP ASE using a Web browser.

In some cases, you may want to use a central SCC server to manage multiple SAP ASE servers and other products rather than using the SCC server that is installed with each SAP ASE server. Deployment considerations include:

- Minimizing network latency – you see better performance if you install SCC near the monitored servers and near the workstations on which SCC Web clients are running.
- Unified SCC environment – installing SCC in a central location lets you manage and monitor your servers from a single SCC installation, which is especially useful in a replication environment.
- Administration and security – you can exercise differing levels of control in different parts of your enterprise, for example, by protecting the data in some servers more strictly than in others.

See *Preinstallation Tasks* in *SAP Control Center Installation Guide* for details on installation and deployment considerations.

In a production environment, we recommend that you install the SCC server on a machine other than the one you plan to run SAP ASE on.

See the following for detailed SCC information:

- *SAP Control Center Release Bulletin* – provides last-minute installation and upgrade information, as well as known problems.
- *SAP Control Center Installation Guide* – provides complete installation, configuration, and troubleshooting procedures.
- *SAP Control Center for Adaptive Server Enterprise* – includes SAP ASE configuration procedures, user assistance, and troubleshooting information.

Related Information

Starting and Stopping SAP Control Center [page 50]
Installing SAP ASE in GUI Mode [page 35]
Minimally Configuring an SAP ASE Server [page 40]

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4.4 Client Components and Utilities

There are several components that you can install onto a PC client to support the SAP ASE server, which are downloaded from the SAP Service Marketplace (SMP). The previous PC-Client installer is replaced in ASE 16.0 by separately downloadable installers that provide many of the same components.

SDK for SAP ASE

The SAP Service Marketplace provides both 32-bit and 64-bit SDK for SAP® ASE images. Download the software development kit (SDK) that matches your version of Windows (32- or 64-bit).

Use either method to obtain the SDK from *SAP Service Marketplace* > *SAP Software Download Center*:

- Select *Support Packages and Patches* > *A-Z Index* > *S* > *SDK for SAP ASE*
- In the search field at *Support Packages and Patches*, enter **`SDK for SAP ASE`**.

Included in the SDK are:

Product	Description
Open Client™	In addition to Open Client (Client Library, `dblib`), the following, which are all installed into the `OCS-16_0` directory: • ESQL/C • ESQL/COBOL • XA • SAP ASE extension module for Python • SAP ASE database driver for Perl • SAP ASE extension module for PHP
DataAccess	Installed into the `DataAccess64` directories: • ODBC – a driver used that connects to SAP ASE from ODBC-based applications. • ADO.NET – a provider used that connects to SAP ASE from .NET-based applications.
Java Runtime Environment (JRE)	Installed into the `shared` directory, JRE is a runtime Java virtual machine used to execute Java-based programs, such as Interactive SQL, and which is shared by several other components.
Language Modules	Installed into the `locales` directory. Provides system messages and date/time formats.
Character Sets	Installed into the `charsets` directory. Provides character sets that are available for use with SAP ASE.
jConnect	Installed into the `jConnect-16_0` directory, jConnect provides a Java Database Connectivity (JDBC) driver for SAP ASE.
Interactive SQL	Installed into the `DBISQL-16_0` directory, Interactive SQL is a GUI tool that allows you to execute SQL statements, build scripts, and display data from SAP ASE.

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Product	Description
jutils-3_0 utilities	A collection of SAP ASE utility programs that includes `ribo`, a tool to trace TDS traffic between a client program and SAP ASE.

See the *SDK Installation Guide* at the SAP Service Marketplace for installation instructions.

PowerDesigner Physical Modeler

The modeler is available in the ASE SAP 16.0 section of the SAP Service Marketplace, and is installed from its own image.

To install the modeler, download and extract the file, then run `setup.exe` in your root directory.

SySAM Utilities

Access these utilities by searching for **`sysam 2.3`** in the SAP Service Marketplace.

Follow the installation instructions in the *Info* tab for SySAM 2.3 in the SAP Service Marketplace.

QP-Tune

Run this components from the SAP ASE server image directly.

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5 System Requirements

Before installing SAP ASE version 16.0, ensure that your system is updated with the latest patches and system requirements. Do not use a patch that is earlier than the version suggested for your operating system. Use the patch recommended by the operating system vendor, even if it supersedes the patch listed.

To list all currently installed patches and display the operating system version level, enter:

```
rpm -q -a
```

SAP ASE supports Pentium and higher chip sets.

Table 2: Operating System Requirements for Linux

Hardware	Operating System	Recommended RAM
x86_64 processor (Intel Xeon with EM64T)	Red Hat Enterprise Linux Server release 6.1 (Santiago) • kernel-2.6.32-71.el6.x86_64 • glibc-2.12-1.7.el6.x86_64 • compat-glibc-2.5-46.2.x86_64	1GB
x86_64 processor (AMD Opteron or Intel Xeon with EM64T)	SuSE Linux Enterprise Server 11 (x86_64); version 11 patch level 0: • kernel-2.6.27.19-5.1 • glibc-2.9-13.2	1GB

Linux requires these additional files:

Required Files	Description
Required libraries for Linux	• openmotif-2.3.1-2.el5 • libXp-1.0.0-8.1.el5 • libXt-1.0.2-3.1.fc6 • libXtst-1.0.1-3.1 • libXi-1.6.1-1 • libXmu-1.0.2-5 • libXext-1.0.1-2.1 • libSM-1.0.1-3.1 • libICE-1.0.1-2.1 • libX11-1.0.3-9.el5
Required X/Motif-related RPM package manager files	• libXtst-devel • libXi-devel • openmotif-devel • libXmu-devel • libXt-devel • libXext-devel

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Required Files	Description
	• libXp-devel • libX11-devel • libSM-devel • libICE-devel These files should be compatible with RHEL5.3 or later.

There is a known OS kernel bug in scheduling threads in RHEL 6.0 that has been fixed in RHEL 6.1; for this reason, you use 6.1.

Linux system memory requirements are:

- Minimum RAM required for SAP ASE, with default stack size, packet size, and user log cache size – 127 MB
- Minimum RAM per additional user – approximately 324KB
- Default user stack size – 128KB

Table 3: Linux Disk Space Requirements

Product	Linux X64 Requirements	Linux X64 PSeries Requirements
SAP ASE typical installation	921MB	1092MB
Default databases created during installation	306MB	164MB
Total	1071MB	1256MB

Before you can install a 64-bit SAP ASE version 16.0 to a Red Hat Enterprise Linux 6.x x86_64, install the 32-bit GNU C Libraries package (glibc-2.xx-x.xx.el6.i686.rpm).

To run the installer in Chinese, Japanese, or Korean, install the appropriate RPM package:

Operating System	Language	RPM Package
RedHat 5.x	Chinese	`fonts-chinese`
	Japanese	`fonts-japanese`
	Korean	`fonts-korean`
SuSE 10.x	Traditional Chinese	`ttf-founder-traditional`
	Japanese	`sazanami-fonts`
	Korean	`baekmuk-ttf`

Ensure that you have the required operating system patches for the SAP Java Runtime Environment (JRE) version 7.1. See SAP Note 1367498 (*https://service.sap.com/sap/support/notes/1367498*) for the JRE requirements. Log in with your SAP support account to view the SAP note.

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5.1 Memory Requirements

Each operating system has a default maximum shared-memory segment. Configure your operating system to allow the allocation of a shared-memory segment at least as large as the maximum memory value.

The amount of memory SAP ASE can use on a Linux system is chip-dependent.

The amount of memory SAP ASE can use is:

- On Sun Solaris 10 (SPARC) – 16EB
- On Sun Solaris 10 on AMD (x86) – chip-dependent

5.2 System Requirements for Clients

Check the system requirements for the machine on which you plan to install the client applications and utilities.

Type	Requirement
Product	Programs and utilities installed onto the PC client
Hardware	X86 or X64 system running Xeon or AMD 1.5 GHz or faster
Operating system	Windows Server 2012, Windows 2008 R2 SP1, Windows 2008 x86, Windows 8, Windows 7 SP1
Suggested minimum RAM	512MB

> **Note**
>
> If you are using ODBC or ADO.NET drivers, make sure that Microsoft .NET Framework 2.0 Service Pack 1 is installed on your Windows machine. To confirm that it is installed, select *Control Panel* > *Add or Remove Programs* and verify that .NET Framework appears in the list of currently installed programs.

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6 Planning Your SAP ASE Installation

Before you install or upgrade, prepare your environment.

Procedure

- Identify the components and options to install or upgrade.
- Obtain a license.

  > **Note**
  >
  > If you are using a served license, you must install the SySAM license server version 2.1 or later.

- Make sure your system meets all requirements for your installation scenario and planned use.

6.1 SAP ASE Release Bulletin

The release bulletin contains last-minute information about installing and upgrading SAP ASE software.

The latest release bulletins are available at the Product Documentation Web page at *http://sybase.com/support/manuals*.

6.2 Obtaining a License

Before installing your product, choose a SySAM license model, and obtain license files from the SAP Service Marketplace (SMP) at *http://service.sap.com/licensekeys*

Context

> **Note**
>
> If you purchased your product from Sybase® or an authorized Sybase reseller and have not been migrated to SAP Service Marketplace (SMP), go to the Sybase Product Download Center (SPDC) at *https://sybase.subscribenet.com* to generate license keys.

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Procedure

1. Choose a SySAM license model.

License Model	Description
Unserved license model	Licenses are obtained directly from the license file. If you are using an unserved license, save the license file to the machine on which you install the product.
Served license model	A license server manages the allocation of licenses among multiple machines.

> **Note**
>
> The SAP ASE installer automatically installs a SySAM license server if you choose the full installation option or enter a served license when prompted for the SySAM license key. You can also install the license server using the installer's custom installation option. See the *SySAM Users Guide* to generate licenses.

2. For the served license model, decide whether to use an existing or new license server.

   The license server and your product installation need not share the same machine, operating system, or architecture.

> **Note**
>
> There can be only one instance of a SySAM license server running on a given machine. To set up a SySAM 2 license server on a machine that is already running a SySAM 1.0 license server, follow the migration instructions in the *SySAM Users Guide*. A migrated license server can serve licenses for both SySAM 1.0 and SySAM 2-enabled products.

3. Get your host IDs.

   When you generate licenses, you must specify the host ID of the machine where the licenses will be deployed.

   - For unserved licenses – the host ID of the machine where the product will run. If you are running a product with per-CPU or per-chip licensing that supports SySAM sub-capacity and want to run the product in a virtualized environment, see *SySAM Sub-capacity Licensing* in the *SySAM Users Guide*.
   - For served licenses – the host ID of the machine where the license server will run.

4. Before installing your product, obtain license files from SMP or from SPDC using the access information in your welcome e-mail message.

> **Note**
>
> If you purchased your software from a reseller, rather than an e-mail message you may receive a Web key certificate that contains the location of the SPDC Web key login page at *https://sybase.subscribenet.com/webkey* and the activation key to use for the login name.

   If you plan to use sub-capacity licensing, see the *SySAM Users Guide* for information on how to configure using the `sysamcap` utility.

   Use `sp_lmconfig` to configure and show license management-related information in SAP ASE. See `sp_lmconfig` in *Reference Manual: Procedures*.

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6.2.1 Comparing License Deployment Models

Learn about license deployment models.

Unserved Licenses	Served Licenses
Licenses can be used only on the machine for which the license was generated.	Licenses can be distributed from a network license server to products running on any network machine.
Generate licenses at SMP or SPDC for each machine that will run the product: 1. Specify the host ID of the machine where the product will run. 2. Generate a license for that machine. 3. Save the license to the specified machine. 4. Repeat steps 1 – 3 for each machine where the product will run.	Generate licenses at SMP or SPDC for products running on multiple machines: 1. Specify the host ID of the license server. 2. Specify the number of required licenses. 3. Save the licenses to the license server host machine.
No license administration is required. However, when new licenses are required for product updates, you must update and deploy each license for each machine where the product update will run.	The license server requires administration. When new licenses are required for product updates, SMP or SPDC lets you update all licenses for a specific license server in a single step.
No license reporting or asset management capabilities are available.	Allows license monitoring and reporting of license use, capacity planning, and asset management.
Installed locally and always available.	Requires a functioning license server and network. If the license server or network fails, you must fix the problem or install an alternate license server before the product grace period expires.
If a machine where the product is running fails, you must regenerate all of its licenses and deploy those licenses to the replacement machines.	If a machine where the product is running fails, you can move the product to a new machine, and it will acquire licenses from the running license server. If the license server host machine fails, use the Manage License Hosts functionality at SMP or SPDC to move its licenses to a new network license server host.
License files are distributed across each machine running a product, and therefore they are difficult to manage and control.	License files are centrally located and managed.
Unserved Standalone Seat (SS) licenses do not allow product use via Remote Desktop Connection or other terminal services clients.	Products can be used via Remote Desktop Connection or other Terminal Services clients, irrespective of the type of license in use.

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6.2.2 SySAM License Server

If you choose to use the served licensed model, make sure you have installed the required SySAM license server version.

The license server is a lightweight application that serves licenses to products running on any operating system.

A license server can run on a low-end machine or a machine with spare cycles. For example, a license server running on a Solaris UltraSparc-60 serving 100 different licenses to 200 product instances, used 50MB of memory, 5 minutes of CPU time per week, and 100MB of disk space per year.

SAP ASE 16.0 requires SySAM 2.3 or later. To determine the current license server version, use the `sysam version` command.

> **Note**
>
> This command is not available in SySAM version 2.0 and earlier.

Download the latest SySAM version from *http://service.sap.com/patches*.

SAP ASE 16.0 and SySAM 2.3 use FlexNet Publisher version 11.11.

To check the version of FlexNet Publisher used by your license server, examine the license server log or execute the `lmgrd -v` command.

The license server installer is available in the **<ASE_installer>**`/sysam_setup` directory.

> **Note**
>
> You cannot start the license server until there is at least one served license saved to the `licenses` directory on the license server host machine.

6.2.3 Determining Host IDs

When you generate licenses at SMP, you must specify the host ID of the machine where the licenses will be deployed.

Context

- For unserved licenses, specify the host ID of the machine where the product will run. If you are running a product with per-CPU or per-CHIP licensing that supports SySAM sub-capacity, and you want to run the product in a virtualized environment, see *SySAM Sub-capacity Licensing* in the *SySAM Users Guide* for information about determining the host ID for unserved licenses.
- For served licenses, specify the host ID of the machine where the license server will run.

SMP remembers the host information so that you can select the same license server when generating additional licenses.

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To determine the host ID of the machine, run the `lmutil` utility from a terminal window or the Windows command prompt. For example:

```
lmutil lmhostid
```

> **Note**
>
> You can download the `lmutil` utility from either:
>
> - The SAP ASE installer image, under the `sysam_utilities` directory; or,
> - The Flexera Software Web site at *http://www.globes.com/support/fnp_utilities_download.htm* .

You can also determine the host ID using native operating system commands. See the Frequently Asked Questions topic "What is my Host ID?" at *https://websmp208.sap-ag.de/~sapidb/011000358700001006652011E* (requires login)

.

6.2.3.1 Determining Host IDs for Machines with Multiple Network Adapters

On some platforms, the host ID is derived from the network adapter address.

Context

If the machine where your product is installed or where the license server is hosted has multiple network adapters, running `lmutil lmhostid` returns one host ID for each network adapter, and returns output similar to this:

```
The FLEXlm host ID of this machine
is ""0013023c8251 0015c507ea90""
Only use ONE from the list of hostids.
```

It is important that you:

- Choose only one host ID to enter during license generation.
- Use the value associated with the primary wired Ethernet adapter.
- Do not use values associated with internal loopback or virtual adapters.

If you cannot determine the host ID using the `lmutil lmhostid` output, use the native operating system commands to get additional details.

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6.2.3.2 Using Alternate Host IDs on Windows

If your Windows machine does not have a network adapter, SySAM allows you to use an alternate host ID based on the hard disk serial number.

Procedure

1. At a Windows command prompt on the machine where you will deploy your license, enter:

   ```
   lmutil lmhostid -vsn
   ```

   This returns output similar to:

   ```
   The FLEXlm host ID of this machine is "DISK_SERIAL_NUM=70ba7a9d"
   ```

2. Use the complete output (`DISK_SERIAL_NUM=70ba7a9d`) for the host ID value requested during license generation.

6.2.4 Generating Licenses

Before you generate licenses, gather the necessary information and complete these tasks.

Table 4: Information Needed Before License Generation

Required Information or Action	License Model		Description
	Served	Unserved	
License deployment model	X	X	Decide whether to use a served or unserved license deployment model. Typically, this is a company-wide decision that is made only once. Therefore, this is one of the most important things to determine before license generation.
Product machine host ID		X	Determine the host ID of the machine, or machine partition where the product will run.
License server – download and install	X		Download and install the SySAM license server before you generate the product's licenses, and before you install the product.
License server host ID	X		Determine the host ID of the machine where the license server will run.
License server host name	X		Determine the host name of the machine where the license server will run.

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Required Information or Action	License Model		Description
	Served	Unserved	
License server TCP/IP port numbers	X		Determine the two port numbers on which the license server will listen for license requests.

6.2.4.1 Generating License Keys at SMP

Use SMP to generate license keys.

Procedure

1. Go to the SAP Marketplace main page at *http://service.sap.com/licensekeys*.
2. Log in using your SMP credentials.
3. Select *SAP Support Portal*.
4. Select *Keys & Requests* > *License Keys*.
5. Follow the instructions in the "How to generate license keys for SAP Sybase products" presentation available under the "Documentation and Helpful Resources" quick access link.

6.2.5 Knowing the Product License Type

SAP sells products under different license types, which entitle the customer to different rights of use. For example, whether a product is entitled to be used in production, or standby, or development and test environments.

The license type determines the quantity of licenses required; dictating, for example, whether a license is required for each machine; or for each CPU, or CPU chip; or per terabyte of storage.

For example, a product purchased under the CPU License (CP) type requires one license per CPU on the machine, partition, or resource set where it will run. The same product purchased under the Server License (SR) type requires a single license for the machine, partition, or resource set.

Your account can have the same product licensed under multiple license types. Make sure you select the correct license type when you generate your SySAM license file.

When you generate licenses, each license type is presented on the License Information screen in bold font. For example:

```
License Type: CPU License (CP)
```


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6.2.5.1 Optional Feature Licenses

Some SAP ASE applications are offered as base products with optional features that require a separate license.

Customers can mix license types. For example, customers can order SAP ASE under the Server License (SR) license type and order an optional feature (for example, High Availability or Enhanced Full Text Search) under the CPU License (CP) type.

Optional features are licensed only with the base product of the same product edition. For example, if you order SAP ASE, you cannot use a Small Business Edition optional feature license with the Enterprise Edition base product. In addition, the entitled use of the license types must be compatible; for example, both types should allow use in a production environment.

6.2.5.2 SySAM Licensing Checkout

If SAP ASE is licensed using a per-processor license type, it checks out a license quantity equal to the number of processors, or, if insufficiet licenses are available, allows a 30-day grace period.

If the number of processors is dynamically increased while running and the software cannot check out additional licenses, the software permits a 30-day grace period. If sufficient licenses are not made available within the grace period, the software shuts down. Decreasing the number of processors that the software can use while it is running does not reduce the required license quantity. You must restart the SAP ASE server on the correct number of processors.

See the *SySAM Users Guide*.

6.2.5.3 Sub-capacity Licensing

Sub-capacity licensing allows you to license a subset of the CPUs available on a physical machine using the SySAM sub-capacity license functionality.

Platform support

Table 5: SySAM Virtualization Sub-Capacity Compatibility

Vendor	Product	Platform Support	Virtualization Type
HP	nPar	HP IA 11.31	Physical partition
	vPar		Virtual partition
	Integrity Virtual Machines with Resource Manager		Virtual machine

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Vendor	Product	Platform Support	Virtualization Type
	Secure Resource Partitions		OS containers
IBM	LPAR	AIX 6.1, AIX 7	Virtual partition
	dLPAR		Virtual partition
Sun	Dynamic System Domains	Solaris 10	Physical partition
	Solaris Containers/Zones with Solaris Resource Manager		Virtual partition
	Sun Logical Domain (LDOM)		Virtual partition
Intel, AMD	VMWare ESX Server Guest O/S: Windows **Note** VMWare ESX Server excludes VMWare Workstation, and VMWare Server.	VMWare ESX 3.5, ESX 4.0 and ESX 4.1, ESXi4.1, ESXi 5.0, Guest OS: Windows 2008 R2, Windows 7	Virtual machine
	VMWare ESX Server Guest OS: Linux, Sun Solaris x64	VMWare ESX 3.5, ESX 4.0 and ESX 4.1, ESXi4.1, ESXi 5.0, Guest OS: RH 5.5, SuSE 11, Sun Solaris x64	Virtual machine
	Xen, KVM, DomainU: Windows **Note** Xen excludes Sun Solaris x64.	Windows 2008 R2, Windows 7	Virtual machine
	Xen, KVM, DomainU: Linux	RH 5.5, SuSe 11	Virtual machine
	Hyper-V	Windows 2008 R2	Virtual machine

Enabling Sybase Sub-Capacity Licensing

If you purchased your product from Sybase or an authorized reseller, you must have a sub-capacity licensing agreement with SAP or Sybase before you can enable sub-capacity licensing.

Note

Keep your license server up-to-date.

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Although the installation media includes a copy of the most recent SySAM license server, we recommend that you periodically check for updates at *http://service.sap.com/patches*.

When using SySAM sub-capacity licensing, set the SYBASE_SAM_CAPACITY environment variable before installing, or copy in the license key after installation.

6.3 Installation Directory Contents and Layout

SAP ASE includes server components that are installed into specific directories.

Product	Description
SAP ASE	Installed into the `ASE-16_0` directory. • SAP ASE – the database server. • Backup Server – an application based on SAP® Open Server™ that manages all database backup (`dump`) and restore (`load`) operations. • XP Server – an Open Server application that manages and executes extended stored procedures (ESPs) from within SAP ASE. • Job Scheduler – provides a job scheduler for SAP ASE. Job Scheduler components are located in `ASE-16_0/jobscheduler/`.
Connectivity	Installed into the `OCS-16_0` directory: • Open Client™ (**`<Client Library>`**, **`<dblib>`**) • ESQL/C • ESQL/COBOL • XA Installed into the `DataAccess` and `DataAccess64` directories: • ODBC (Windows, Solaris SPARC, Solaris x64, Linux Power, HP-UX Itanium, IBM AIX) – a driver used to connect to SAP ASE from ODBC-based applications. • ADO.NET (Windows only) – a provider used to connect to SAP ASE from .NET based applications.
Shared Directory	The `shared` directory contains components and libraries that are shared by several other components. In earlier versions, this directory was named `shared-1_0`. • Java Runtime Environment (JRE) – is a runtime Java virtual machine used to execute Java-based programs, such as SAP Control Center. SAP ASE includes the JRE. In typical installations, by default, the JRE is fully installed. In custom installations, if you select a component for installation that requires the JRE, the JRE is also automatically selected. It is located in the `shared/SAPJRE-7_1 *` directory.
SAP Control Center	SAP Control Center logs and utilities – files related to the Web-based tool for monitoring the status and availability of SAP ASE servers. They are installed into the `$SYBASE/SCC-3_3` directory.

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Product	Description
	Note The SAP ASE typical installation option installs only the SCC Remote Command and Control (RCC) agent. To use a GUI-based connection to the SCC server using a Web browser, you must use the custom installation option to install the SCC Management User Interface for SAP ASE.
Language Modules	Installed into the `locales` directory. Provides system messages and date/time formats.
Character Sets	Installed into the `charsets` directory. Provides character sets that are available for use with SAP ASE.
Collation Sequences	Installed into the `collate` directory. Provides the collation sequences that are available for use with SAP ASE.
Sybase Software Asset Management (SySAM)	Installed into the `SYSAM-2_0` directory. Provides asset management of SAP ASE servers and optional features.
Web Services	Installed into the `WS-16_0` directory. An optional product that provides access to SAP ASE using HTTP/SOAP and WSDL.
Interactive SQL	Interactive SQL is a GUI tool that allows you to execute SQL statements, build scripts, and display data from SAP ASE. It is installed into the `DBISQL-16_0` directory.
`jutils-3_0` Utilities	A collection of SAP ASE utility programs including `ribo`, a tool to trace TDS traffic between a client program and SAP ASE.
SAP® jConnect™ for JDBC	Installed into the `jConnect-16_0` directory. Provides a Java Database Connectivity (JDBC) driver for SAP ASE.
OData Server	Installed into the `ODATA-16_0` directory, OData (Open Data Protocol) enables data services over RESTful HTTP, allowing you to perform operations through URIs (Universal Resource Identifiers) to access and modify information.

Note

We strongly recommend that you install the ECDA DirectConnect option or MainframeConnect™ DirectConnect™ for z/OS, including DirectConnect Manager, into its own directory.

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6.4 Creating the Sybase User Account

To ensure that SAP ASE product files and directories are created with consistent ownership and privileges, create a system administrator account.

Context

One user—typically the system administrator, who has read, write, and execute privileges—should perform all installation, configuration, and upgrade tasks.

Procedure

1. To create a system administrator account, choose an existing account, or create a new account and assign a user ID, group ID, and password for it.

   This account is sometimes called the “sybase” user account. See your operating system documentation for instructions on creating a new user account.

   If you have installed other SAP software, the "sybase" user should already exist.
2. Verify that you can log in to the machine using this account.

6.5 Preparing to Install SAP ASE

Before you start the installer, prepare your system.

Procedure

1. Back up your current system.
2. If you plan to run the installer in Chinese, Japanese, or Korean, install one of these RPM packages:

Option	Description
On RedHat 5.x	○ fonts-chinese ○ fonts-japanese ○ fonts-korean
On SuSE 0.x	○ ttf-founder-traiditional – traditional Chinese ○ sazanami-fonts – Japanese ○ baekmuk-ttf – Korean

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3. Verify that you can uncompress files on your UNIX machine. To uncompress:

Option	Description
`.zip` files	Use the `unzip` command
`.tgz` files	Use `gzip` or GNU `Tar`

4. Ensure that the account used to start the server has read and write permissions for the directory in which you are installing the server. You may need to create nonadministrative logins to install the server into personal directories.
5. Unset the LD_ASSUME_KERNEL variable.
6. Review the SySAM licensing procedures, and plan your server configuration using the configuration guide for your platform.
7. For consistency and security, create an account with administrative privileges. This user account could be "sybase" or any other user name. Use this account to perform all installation and device-creation tasks.

   This user must have permission privileges from the top (or root) of the disk partition or operating system directory, down to the specific physical device or operating system file. Maintain consistent ownership and privileges for all files and directories. A single user—the system administrator with read, write, and execute permissions—should perform all installation, upgrade, and setup tasks.

   If you are installing SAP ASE on more than one computer, create the "sybase" user account on each machine.
8. Log in to the machine as “sybase.”
9. If you have enabled the Java in the database feature, create the `sybpcidb` database and disable the feature during the installation.
10. Decide where to install SAP ASE:
    - Make sure there is sufficient disk space and temporary directory space available.
    - Ensure there are no spaces in the path name of the directory.
11. Decide whether you want licensing events to trigger e-mail alerts, and the severity of the events that generate e-mail messages.

    If you choose to have e-mail notifications for license events, know your:

    - SMTP server host name
    - Port number for an SMTP server

      > **Note**
      >
      > If SAP assigns any port numbers to you for use with SAP ASE, exclude these numbers from any port-scanning software you run. SAP ASE attempts to service each scan as a login attempt, which may lead to poor performance.

    - E-mail return address
    - Recipients of the notifications
    - Severity level of an event that triggers mail. Your choices are:
      - None
      - Informational
      - Warning
      - Error
12. Verify that your network software is configured.

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SAP ASE and client applications use network software even when they are installed on a machine that is not connected to a network.

If you are having connection problems, or to verify your network configuration, ping the host.

13. Adjust the shared memory for your operating system.

6.5.1 Adjusting the Operating System Shared Memory Parameters

Adjust shared memory segments if SAP ASE cannot obtain large memory as a single segment, or if Backup Server stripes fail due to insufficient segments.

Context

Depending on the number and types of devices used for backup (`dump`) and recovery (`load`), you may need to adjust the shared memory segment parameter in the operating system configuration file to accommodate concurrent Backup Server processes. There are six default shared memory segments available for process attachments.

If any reconfiguration through `sp_configure` requires additional memory, SAP ASE allocates shared memory segments after start-up. To account for these additional segments, allocate the maximum memory that is available to SAP ASE by using the `allocate max shared memory` configuration parameter. See the *System Administration Guide*.

Procedure

1. The operating system shared memory default, for most Linux releases, is 32MB. The minimum required by SAP ASE is 64MB for a default server that uses 2K pages. A higher value is required if you plan to increase the SAP ASE server's `total memory`. Set the stack size to `unlimited` to avoid shared memory attachment problems. Set this using `ulimit -s unlimited` on the Bourne shell, or `limit stacksize unlimited` on the C shell.
2. To check and adjust the operating system shared memory parameter, use the `sysctl(8)` method:

   To check the current shared memory size, enter:

   ```
   # /sbin/sysctl kernel.shmmax
   ```

   To adjust the shared memory size at runtime, enter the following, where **<nnn>** is 1073741824 for 1GB of shared memory:

   ```
   # /sbin/sysctl -w kernel.shmmax=nnn
   ```


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> **Note**
>
> The default operating system shared memory for some older Linux releases is 32MB. The minimum required by SAP ASE is 64MB for a default server with 2K pages. A higher value is required if you plan to increase the SAP ASE `max` setting.

3. To guarantee that the minimum operating shared value is applied every time the system is started, edit the `/etc/sysctl.conf` file.
4. For larger configurations, it may also be necessary to adjust the `shmall` parameter.

   The default on RHEL5 is 8GB (2097152 4K pages). SuSE 11 and RHEL6 have a default high enough that no adjustment should be necessary.
5. By default, SAP ASE starts in threaded mode. If you need to switch to process mode, you must adjust the Linux kernel parameters to maintain compatibility:
   a) Add the following in `/etc/sysctl.conf`:
      - In Linux RHEL 5 and later:

        ```
        kernel.exec-shield=0
        kernel.randomize_va_space=0
        ```
      - In SLES 11 and later:

        ```
        kernel.randomize_va_space=0
        ```

   b) As super user (root), for the action to take effect, enter:

      ```
      /sbin/sysctl -P
      ```

   For information about
   - Kernel modes, see *SAP ASE System Administration Guide Volume 2 > Managing Multiprocessor Servers*.
   - Exec-Shield, see *http://www.redhat.com/f/pdf/rhel/WHP0006US_Execshield.pdf* .

6.5.2 Managing Java in the Database During Installations and Upgrades

If you have enabled Java in the database, create the `sybpcidb` database before installing or upgrading to SAP ASE version 16.0.

Procedure

1. Create the `sybpcidb` database, which stores configuration information for the pluggable component interface (PCI) and all pluggable component adapter (PCA) components. This database is used by the `installpcidb` script. For example:

   ```
   1> disk init
   2> name = "sybpcidb_dev",
   ```


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```
3> physname = "${SYBASE}/data/sybpcidb_dev.dat",
4> size = "48M"
5> go
1> create database sybpcidb on sybpcidb_dev = 48
2> go
```

The device and database sizes depend on the SAP ASE server page size. The minimum and default size requirements for `sybpcidb` are:

- 2KB page size server – 48MB
- (Default) 4KB page size server – 96MB
- 8KB page size server – 192MB
- 16KB page size server – 384MB

2. Disable Java in the database:

```
1> sp_configure 'enable java', 0
2> go
```

3. Reenable the feature after you have successfully installed or upgraded to SAP ASE 16.0:

```
1> sp_configure 'enable java', 1
2> go
```

6.5.3 Multipathing

Multipathing is the ability of a server to communicate with the same physical or logical block storage device across multiple physical paths between the host bus adapters (HBAs) in the server and the storage controllers for the device, typically in Fibre Channel (FC) or iSCSI SAN environments. You can also achieve multiple connections with direct attached storage when multiple channels are available.

Multipathing provides connection fault tolerance, failover, redundancy, high availability, load balancing, and increased bandwidth and throughput across the active connections. Multipathing automatically isolates and identifies device connection failures, and reroutes I/O to alternate connections.

Typical connection problems involve faulty adapters, cables, or controllers. When you configure multipathing for a device, the multipath driver monitors the active connection between devices. Because multipathing is managed at the device level, when the multipath driver detects I/O errors for an active path, it fails over the traffic to the device's designated secondary path. When the preferred path becomes healthy again, control can be returned to the preferred path. Multipathing prevents single points of failure in any highly available system.

A common example of multipath connectivity is a SAN-connected storage device. Usually one or more Fibre Channel HBAs from the host are connected to the fabric switch and the storage controllers are connected to the same switch. A simple example of multipath connectivity is: two HBAs connected to a switch to which the storage controllers are connected. In this case, the storage controller can be accessed from either of the HBAs that are providing multipath connectivity.

All OS platforms provide their own solutions to support multipathing. There are numerous other vendors that also provide multipathing applications for all available platforms, such as:

- AIX – Multiple Path I/O (MPIO)
- HP-UX 11.31 – Native MultiPathing (nMP)
- Linux – Device-Mapper (DM) Multipath

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- Solaris – Multiplexed I/O (MPxIO)
- AntemetA Multipathing Software for HP EVA Disk Arrays
- Bull StoreWay Multipath
- NEC PathManager
- EMC PowerPath
- FalconStor IPStor DynaPath
- Fujitsu Siemens MultiPath
- Fujitsu ETERNUS Multipath Driver
- Hitachi HiCommand Dynamic Link Manager (HDLM)
- HP StorageWorks Secure Path
- NCR UNIX MP-RAS EMPATH for EMC Disk Arrays
- NCR UNIX MP-RAS RDAC for Engenio Disk Arrays
- ONStor SDM multipath
- IBM System Storage Multipath Subsystem Device Driver (SDD)
- Accusys PathGuard
- Infortrend EonPath
- OpenVMS
- FreeBSD - GEOM_MULTIPATH and GEOM_FOX modules
- Novell NetWare
- Sun StorEdge Traffic Manager Software
- ATTO Technology multipath driver Fibreutils package for QLogic HBAs
- RDAC package for LSI disk controllers
- lpfcdriver package for Emulex HBAs
- Veritas Dynamic Multi Pathing (DMP)
- Pillar Data Systems
- Axiom Path
- iQstor MPA

6.5.3.1 Setting Up Multipathing

If you choose to use it, set up multipathing before you install SAP ASE.

Context

There are several multipath applications are available. Native Linux Device-Mapper (DM) Multipath support has been added to the Linux 2.6 kernel tree with the release of 2.6.13, and has been backported into Red Hat

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Enterprise Linux 4 in Update 2 and into Novell SUSE Linux Enterprise Server 9 in Service Pack 2. To setup multipathing on Linux:

Procedure

1. Edit the `/etc/multipath.conf` file:
   - Comment out the following lines at the top of the file. This section of the configuration file, in its initial state, blacklists all devices. You must comment it out to enable multipathing:

     ```
     blacklist {
           devnode "*"
     }
     ```
   - Add configuration information. For example:

     ```
             multipath {
                     wwid    360060e80056fb70000006fb700000816
                     alias   TEST_DATA
                     path_grouping_policy failover
                     mode 660
                     uid 8205
                     gid 471
             }
     ```
2. Run these commands:

   ```
   # modprobe dm-multipath – add multipathing module to Linux kernel
   # modprobe dm-round-robin – add multipathing round-robin module to Linux kernel
   # /etc/init.d/multipathd start – start multipath service
   # multipath – automatically detect multiple paths to devices and configure
   multipathing
   # chkconfig multipathd on – turn on multipath service
   # multipath –l – displays all paths to devices
   ```

   The `/dev/mapper/mpath<N>` devices are persistent and they are created early in the boot process. Use these device names to access the multipathed devices.

   For example:

   - `/usr2/sybase/ASE1503/dev/wdb_data` – is a symbolic link pointing to `/dev/raw/raw73`.
     - `/dev/raw/raw73` – is a raw character device mapped to `/dev/mapper/mp_wdb_data`.
       - `/dev/mapper/mp_wdb_data` – is a multipath device that contains two paths: `/dev/sdbf` and `/dev/sds`.
         - `/dev/sdbf` – is a block device that corresponds to SCSI generic raw character device `/dev/sg61`.
         - `/dev/sds` – is a block device that corresponds to SCSI generic raw character device `/dev/sg20`.

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7 Installing SAP ASE

Install SAP ASE using your chosen method.

Prerequisites

Complete installation planning tasks.

Procedure

1. Choose an installation method:
   - GUI wizard (recommended)
   - Console mode
   - Response file
2. Follow the instructions for your chosen method.
3. Perform postinstallation steps.

7.1 Installing SAP ASE in GUI Mode

Use GUI mode to install SAP ASE and related products.

Prerequisites

Shut down all programs before running the installer.

Context

The installer creates the target directory (if it does not yet exist) and installs the selected components into that directory.

> **Note**
>
> Version 16.0 includes new major versions of SAP ASE and many supporting components. Installing version 16.0 into the same directory with existing products should not impact the existing products.

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SAP ASE version 15.5 and later uses InstallAnywhere for its installation, while versions earlier than 15.5 and other products use InstallShield Multiplatform. Do not use both installers to install products into the same directory, as this creates files to be installed incorrectly and overwritten without warning.

At the end of the installation, verify that the product has installed correctly. You may also need to perform additional configuration procedures.

Procedure

1. Insert the installation media in the appropriate drive, or download and extract the SAP ASE installation image from the SAP Service Marketplace (SMP).
2. If you downloaded the product from SAP Service Marketplace, go to the directory where you extracted the installation image and start the installer:

   ```
   ./setup.bin
   ```

3. If you are installing using a CD or DVD, mount the disk.

   The location of the `mount` command is site-specific and may differ from the instructions shown here. If you cannot mount the drive using the path shown, check your operating system documentation or contact your system administrator.

   Log in as "sybase" and issue:

   ```
   # mount -t iso9660 /dev/cdrom /mnt/cdrom
   ```

4. Launch the installer:

   ```
   cd /mnt/<device_name>
   ./setup.bin
   ```

   Where:

   - **<device_name>** is the directory (mount point) you specified when mounting the CD or DVD drive.
   - `setup.bin` is the name of the executable file name for installing SAP ASE.

   If there is not enough disk space in the temporary disk space directory, set the environment variable IATEMPDIR to **<tmp_dir>** before running the installer again, where **<tmp_dir>** is where the installation program writes the temporary installation files. Include the full path to **<tmp_dir>**.
5. If you are prompted with a language selection list, specify the appropriate language.
6. On the Introduction screen, click *Next*.
7. Accept the default directory or enter a new path to specify where to install SAP ASE, then click *Next*.

   Note

   Do not use the following when specifying the installation path:

   - Double-byte characters
   - Single- or double-quote characters

   The installer does not recognize these, and displays an error.

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If you see *Choose Update Installation*, this means that there is an older version of SAP ASE in the directory you specified for the installation, and you need to perform an upgrade rather than a new installation.

8. Select the type of installation:

Option	Description
Typical	(Default) Recommended for most users, this option installs a default set of components, including the SAP Control Center Remote Command and Control Agent plug-in. This option does not install: ○ SAP Control Center Management UI ○ SySAM license server
Full	Installs every SAP ASE component, including all the supported language modules, as well as the SCC Agent plug-in and Management UI.
Customize	Lets you select the components to install. Some components are automatically installed if they are required to run your selected components.

9. Select the software license type for the SAP ASE suite:
   - *Install licensed copy of SAP ASE Suite*
   - *Install Free Developer Edition of SAP ASE Suite*
   - *Install Express Edition of SAP ASE Suite*
   - *Evaluate SAP ASE Suite*
     An evaluation is valid for 30 days from the installation date.
10. Choose the most appropriate region, read the license terms, then click *I agree*. Click *Next.*
11. If you have a licensed copy of SAP ASE Suite:
    a) Specify the license type:
       - Enter a license file. If it is a served license key, you are prompted to set up the license server.
       - Use an existing license server.
       - Proceed without specifying license information for the duration of 30 days from the installation date.
    b) Specify the product edition:
       - *Enterprise Edition*
       - *Small Business Edition*
       - *Developer Edition*
       - *Unknown* – select this if you are unsure about the license type.

       > **Note**
       >
       > Choosing *Unknown* prevents you from being able to select *Optimize SAP ASE* later in the installation process.

       Depending on the edition, you can also select the license type under which the product is licensed.
    c) Configure your server to send e-mail notifications about license management events that require attention:
       - SMTP server host name
       - SMTP server port number
       - E-mail return address
       - Recipient e-mail addresses

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- Message severity that triggers e-mail messages

12. In the preinstallation summary, verify the installation type and that you have enough disk space for the installation. Click *Next*.
    The installation status window displays the result of the installation process.
13. In the Configure New Servers window, configure:
    - SAP ASE
    - Backup Server
    - XP Server
    - Job Scheduler
    - SAP Control Center
14. If you select to configure an SAP ASE, you see:
    a) The Configure with Different User Account window, which allows you to enable a different user for the SAP ASE you are installing. If you click *Yes* to enable a different user for the SAP ASE you are installing, enter:
       - The name of the account
       - The password of the account

       SAP ASE, Backup Server, XP Server, and Job Scheduler are then automatically configured under the account name you specify.

       If you keep the default, *No*, the fields are disabled.
    b) The User Configuration Data Directory window.

       > **Note**
       >
       > The default directory is the installation directory. If you specified a different directory, make sure you or the account specified in the Configure with Different User Account window has write permission to it.

       SAP ASE creates these files during installation to place in the data directory:
       - The interfaces file.
       - `RUN_server` file – in the `ASE-16_0/install` subdirectory.
       - Configuration utilities log files – in the `ASE-16_0/init/logs` subdirectory.
       - SAP ASE configuration file (`.cfg`) – in the `ASE-16_0` subdirectory.
       - SAP ASE shared memory file (`.krg`) – in the `ASE-16_0` subdirectory.
       - SAP ASE SySAM properties file – in the `ASE-16_0/sysam` subdirectory.
       - Job Scheduler template `.ini` files – in the `ASE-16_0/jobscheduler/Templates`subdirectory.

       Database device files and server error log files are also created in the data directory you specify, but you can move them after the installation is finished.

Next Steps

Configure some basic settings for SAP ASE, Backup Server, Job Scheduler self-management, Web Services, and the SAP Control Center.

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Related Information

SAP ASE Upgrades [page 65]
Managing SAP ASE with SAP Control Center [page 10]

7.2 Installing SAP ASE in Console Mode

Choose command line installation if you prefer a nonwindowing interface, or if you are developing custom installation scripts.

Prerequisites

Launch the installer in console mode. If the installer launches automatically, click *Cancel* to cancel the GUI installation, then launch the `setup` program from a terminal or console.

Context

The steps for installing components in an interactive text mode are the same as those described for installing in GUI mode, except you use `setup -i console` to execute the installer from the command line, and you enter text to select installation options.

Procedure

1. At the command line, start the installation program:

   ```
   setup.bin -i console
   ```

2. Follow the remaining prompts to install SAP ASE, then specify the basic settings for your installation. The flow of the installation is identical to a GUI installation, except output is written to a terminal window and responses are entered using the keyboard.

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7.3 Minimally Configuring an SAP ASE Server

Use GUI mode to minimally configure an SAP ASE server and related products for use.

Prerequisites

The Configure screen shows a list of everything you can minimally configure. By default, all products are selected. Unselect any products you do not want to configure now. If you are configuring in console mode, enter the corresponding number:

- 1. *Configure New SAP ASE*
- 2. *Configure New Backup Server* – see the *System Administration Guide*
- 3. *Configure New XP Server* – see the *Transact-SQL® Users Guide*
- 4. *Configure Job Scheduler* – see the *Job Scheduler Users Guide*
- 5. *Enable Self Management*
- 6. *Configure SAP Control Center* – see *SAP Control Center Installation Guide*

When finished, click *Next* in the GUI wizard, or enter *0* in console mode. You are now ready to begin configuring the SAP ASE server.

Procedure

1. Set the *Configure New SAP ASE* option:

Option	Description
SAP ASE Name	Default is the machine name.
System Administrator's Password	Enter your password.
Confirm System Administrator's Password	Enter your password.
Port Number	Default is 5000.
Error Log	Name and location of the error log file. Defaults to `servername.log`.
Application Type	These options are numbered only in console mode: ○ 1. (Default) MIXED – both OLTP and DSS. ○ 2. OLTP – online transaction processing generally consists of smaller, less complex transactions. ○ 3. DSS – decision-support systems generally have less update activity with large complex queries.
Page Size	○ 2KB

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Option	Description
	○ (Default) 4KB ○ 8KB ○ 16KB The default page size selection changed from 2KB to 4KB in SAP ASE version 15.5. If you plan to load database dumps from an SAP ASE with a page size that is not 4KB, enter the page size that matches the database dump.
Language	Default: us-english. In typical installations, only us-english is available.
Default Character Set	Default is iso_1.
Default Sort Order	Default is bin_iso_1.
Optimize SAP ASE Server Configuration	Specify *Yes* if you want to optimize the configuration for your system. The default is *No*.
Available Physical Memory for SAP ASE Server	Appears when you select *Yes* for *Optimize SAP ASE Configuration*, and is the numeric value is 80 percent of the sum of combined default physical memory and default OS shared memory. **Note** If you specify a value that is larger than the available resource for allocation to the server, the optimize configuration may fail, causing the server to not start.
Available CPU for SAP ASE	Appears when you select *Yes* for *Optimize SAP ASE Configuration*. The value is 80 percent of the physical CPU, with a default minimum of 1.
Create Sample Databases	Select this option for the installer to install sample databases.

2. After customizing your SAP ASE configuration, click *Next* to record the input fields. You see *Enter the custom configuration values*:

Configuration	Value
Master Device	Name, including location, of the master device.
Master Device Size (MB)	The minimum sizes are: ○ 2KB page size – 29MB ○ 4KB page size – 45MB ○ 8KB page size – 89MB ○ 16KB page size – 177MB The default sizes are: ○ 2KB page size – 36MB ○ 4KB page size – 52MB ○ 8KB page size – 104MB ○ 16KB page size – 208MB

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Configuration	Value
`master` Database Size (MB)	The minimum and default sizes are: ○ 2KB page size – 18MB ○ 4KB page size – 26MB ○ 8KB page size – 52MB ○ 16KB page size – 104MB
System Procedure Device	The complete file path name.
System Procedure Device Size (MB) and System Procedure Database Size (MB)	The default for both is 196MB.
System Device	The complete file path name.
System Device Size (MB) and System Database Size (MB)	The default options for both are: ○ 2KB page size server – 3MB ○ (Default) 4KB page size server – 6MB ○ 8KB page size server – 12MB ○ 16KB page size server – 24MB
`Tempdb` Device	The full path of the device.
`Tempdb` Device Size (MB) and `Tempdb` Database Size (MB)	The default for both is 100MB for all page sizes.
Enable PCI in SAP ASE	Enable the pluggable component interface. The PCI is a generic interface internal to SAP ASE that is installed by default when you install or upgrade SAP ASE. See *Java in Adaptive Server Enterprise*.
PCI Device	Appears when you select *Enable PCI*. The default is `sybpcidbdev_data.dat` in `$SYBASE/data`.
PCI Device Size (MB) and PCI Database Size (MB)	Appears when you select *Enable PCI*. The PCI device and PCI database size are the same: ○ 2KB page size server – 48MB ○ (Default) 4KB page size server – 96MB ○ 8KB page size server – 192MB ○ 16KB page size server – 384MB

After customizing your SAP ASE configuration, click *Next* to record the input fields.

3. Set the *Configure New Backup Server* option:

Configuration	Value
Backup Server Name	The default is **<machinename>**`_BS`.
Port Number	The port number of the Backup Server. The default is 5001.
Error Log	The full path to the error log file.

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Configuration	Value
Allow Hosts	Comma-separated lists of hosts that are allowed to connect to this Backup Server. When null, only the dataserver running on the same host as the Backup Server can access this Backup Server. The default value is null.

4. Set the *Configure New XP Server* option:

Configuration	Value
XP Server Name	The XP Server name is set automatically, in the form of **<machinename>**_XP.
Port Number	The port number of the Backup Server. The default is 5002.
Error Log	The full path to the error log file.

5. Set the *Configure Job Scheduler* option:

Configuration	Value
Job Scheduler Agent name	The default is <**<ASE Server Name>**>_JSAGENT.
Port number	The default is 4900.
Management device	The full path to the device.
Management device size, in MB	The default is 75.
Management database size, in MB	The default is 75.

   Click *Next*.

6. Set the *Configure Self Management* option to create a scheduled job to run `update statistics` on any table in any SAP ASE database:
   - Self-management user name – default is "sa". Entering a new user name creates it in SAP ASE.
   - Self-management password.
7. Set the *SAP Control Center – Configure Self Discovery Service Adapter* option:
   - Configure UDP Adapter
   - Configure JINI Adapter – if you select this option, enter:
     - JINI host name – default is localhost.
     - JINI port number – default is 4160.
     - JINI heartbeat period, in seconds – default is 900.

> **Note**
>
> If you do not select an adapter, you see a message similar to:
> You must choose at least one adapter to configure.

8. If you installed the SAP Control Center Management User Interface for SAP ASE, set the *SCC Configure HTTP Ports* option.

   Accept the default options, or specify other, unused ports, ensuring that the port numbers do not conflict with those used by other applications or services on your system:
   - HTTP port – choose an integer between 1025 and 65535.
   - HTTPs port – choose an integer between 1025 and 65535.

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9. Set the *SAP Control Center – Configure RMI Port* option with a port number (1025 to 65535) that is not used by another application or service on the system. The default is 9999.
10. Set the user names and passwords in *Configure Administration Passwords*. If you installed:

Option	Description
If you installed the SAP Control Center Management User Interface for SAP ASE:	Enter: ○ SCC administrator user ○ SCC administrator password ○ Confirm SCC administrator password
If you installed either the SAP Control Center Management User Interface for SAP ASE or the Remote Command and Control Agent for SAP ASE:	Enter: ○ SCC agent administrator user ○ SCC agent administrator password ○ Confirm SCC agent administrator password

11. Set the *Repository Password* – enter the password for the repository.
12. Verify that the values that appear in the Configure New Servers Summary window are correct, then click *Next*. You see the Configure Server Progress window.
13. In the Installation Completed window:

Option	Description
GUI mode	Click *Done*
Console mode	press *Enter* to exit the installation

Results

SAP ASE and related products have been successfully installed, and minimally configured for use. See *Installing Sample Databases* [page 56], to begin experimenting with your servers, or see the *System Administration Guide* for more advanced topics.

If you encounter any errors, see the *Troubleshooting Guide*.

Related Information

Installing Sample Databases [page 56]
SAP ASE Upgrades [page 65]
Managing SAP ASE with SAP Control Center [page 10]

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7.4 Installing SAP ASE Using a Response File

Unattended or silent installations are typically used to update multiple systems across the enterprise.

Procedure

To perform a silent, or "unattended" installation, run the installer and provide a response file that contains your preferred installation configuration.

7.4.1 Creating a Response File

By saving installation configuration information into a response file during the initial GUI installation, you can perform subsequent installations of SAP ASE using a silent—or unattended—method.

Context

> **Note**
>
> SAP ASE version 16.0 uses a rearchitected installation program that is incompatible with response files generated for versions 15.0.3 and earlier. Do not use response files from these earlier versions; instead, create a new one from a 16.0 installation.

To create a response file when installing in GUI or console mode, specify the `-r` command line argument. The `-r` argument records your responses to the installation wizard prompts and creates a response file when the InstallAnywhere wizard exits. The response file is a text file that you can edit to change any responses before you use it in any subsequent installations. You can find a sample response file in **<installer image>**/`sample_response.txt`.

Procedure

1. Create a response file during GUI installation:

   ```
   setup.bin -r [<response_file_name>]
   ```

   Where:

   - `-r` – specifies the command line argument.
   - **<response_file_name>** – (Optional) is the absolute path of the file into which the installation information is stored, such as `/tmp/responsefile.txt`.

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> **Note**
>
> The directory path you specify must already exist.

2. Verify that the response file includes the passwords for the SAP ASE sa login, SAP Control Center admin, and SCC agent admin by including these lines in the file:

```
SY_CFG_ASE_PASSWORD=<<ASE sa password>>
CONFIG_SCC_CSI_SCCADMIN_PWD=<<SCC admin password>>
CONFIG_SCC_CSI_UAFADMIN_PWD=<<SCC agent admin password>>
CONFIG_SCC_REPOSITORY_PWD=<<SCC repository password>>
```

   Each password must be at least six characters long. The sccadmin and uafadmin logins need not be the same as the sa password.

   You can also set these passwords using these environment variables:

   - SY_CFG_ASE_PASSWORD
   - CONFIG_SCC_CSI_SCCADMIN_PWD
   - CONFIG_SCC_CSI_UAFADMIN_PWD
   - CONFIG_SCC_REPOSITORY_PWD

   > **Note**
   >
   > Secure these response files appropriately if they contain passwords.

3. To enable a different user for the SAP ASE you are installing, define these properties:

```
SY_CFG_USER_ACCOUNT_CHANGE=<yes | no>
SY_CFG_USER_ACCOUNT_NAME=<<user name>>
SY_CFG_USER_ACCOUNT_PASSWORD=<<user password>>
SY_CFG_USER_DATA_DIRECTORY=<<data directory>>
```

   You need not configure `SY_CFG_USER_ACCOUNT_NAME` or `SY_CFG_USER_ACCOUNT_PASSWORD` unless you set `SY_CFG_USER_ACCOUNT_CHANGE` to **yes**.

   For the `SY_CFG_USER_DATA_DIRECTORY` property, enter a directory other than the installed directory to which SAP ASE can create all the data files during configuration.

   SAP ASE creates these files during installation to place in the data directory:

   - The interfaces file.
   - RUN_server file.
   - Configuration utilities log files.
   - SAP ASE configuration file (`.cfg`) – under the `ASE-16_0` subdirectory.
   - SAP ASE shared memory file (`.krg`) – under the `ASE-16_0` subdirectory.
   - SAP ASE SySAM properties file – under the `ASE-16_0/sysam` subdirectory.
   - Job Scheduler template `.ini` files – under the `ASE-16_0/jobscheduler/Templates` subdirectory

   Database device files and server error log files are created in the data directory, but you can move them after the installation is finished.

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> **Note**
>
> Make sure that the user you specify in this property setting has read/write/modify permissions to access the data directory.

7.4.2 Installing in Silent Mode

To perform a silent, or unattended installation, run the installer and provide a response file that contains your preferred installation configuration.

Prerequisites

Use `setup.bin -r` **`<responseFileName>`** to generate a installation response file during a console or GUI installation.

Procedure

1. Run the following, where **`<responseFileName>`** is the absolute path of the file name containing the installation options you chose:

   ```
   setup.bin -f responseFileName -i silent
   -DAGREE_TO_SYBASE_LICENSE=true -DRUN_SILENT=true
   ```

   > **Note**
   >
   > You must agree to the Sybase License Agreement when installing in silent mode. You can either:
   >
   > - Include the option `-DAGREE_TO_SYBASE_LICENSE=true` in the command line argument, or,
   > - Edit the response file to include the property `AGREE_TO_SYBASE_LICENSE=true`.

   Except for the absence of the GUI screens, all actions of InstallAnywhere are the same, and the result of an installation in silent mode is exactly the same as one performed in GUI mode using the same responses.
2. The installer for SAP ASE requires non-null passwords for the sa login in SAP ASE, and uafadmin and sccadmin logins in SAP Control Center. For this reason, add these rows to the response file:

   ```
   SY_CFG_ASE_PASSWORD=<ASE sa password>
   CONFIG_SCC_CSI_SCCADMIN_PWD=<SCC admin password>
   CONFIG_SCC_CSI_UAFADMIN_PWD=<SCC agent admin password>
   CONFIG_SCC_REPOSITORY_PWD=<SCC repository password>
   ```

   Each password must be at least six characters long. The sccadmin and uafadmin logins need not be the same as the sa password.

   You can also set these passwords using thse environment variables:

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- SY_CFG_ASE_PASSWORD
- CONFIG_SCC_CSI_SCCADMIN_PWD
- CONFIG_SCC_CSI_UAFADMIN_PWD
- CONFIG_SCC_REPOSITORY_PWD

> **Note**
>
> For security purposes, treat response files with care if they contain passwords.

7.4.3 Command Line Options

Options for installing or uninstalling SAP ASE in console mode.

Option	Purpose
`-i console`	Uses the console interface mode, where messages appear on the Java console and the wizard runs in console mode.
`-i silent`	Installs or uninstalls the product in silent mode, without user interaction.
`-D`	Passes custom variables and properties. For example, to override the default installation directory when you run the installer, enter: `<install_launcher_name> -DUSER_INSTALL_DIR=/sybase`
`-r`	Generates a response file and a reference.
`-f`	References response files.
`-l`	Sets the installer's locales.
`-\?`	Displays the installer help.

7.5 Uninstalling SAP ASE

To remove SAP ASE, run the installer. The uninstallation process reverses only those actions originally performed by the installer, leaving intact any files or registry entries you created after the installation.

Prerequisites

Shut down all servers.

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Procedure

1. Execute:

   ```
   $SYBASE/sybuninstall/ASESuite/uninstall
   ```

2. Click *Next* in the Uninstall Welcome window.
3. Choose one of the following, then click *Next*:

Option	Description
Complete Uninstall	Uninstalls everything originally installed by the installer.
Uninstall Specific Features	Displays a list of features. If any unselected products/components are dependent on features selected for uninstallation, you can still proceed with the uninstallation but dependent features are not uninstalled.

   You see a window indicating that the uninstallation process is being performed. There is no progress bar.

   > **Note**
   >
   > You may need to confirm the deletion of some files that have been modified since installation.

4. When you see the final window, click *Done* to exit the uninstallation program.
5. Manually remove any files or registry entries you created after the installation.

7.5.1 Removing an Existing SAP ASE Server

Remove an existing SAP ASE server.

Procedure

1. From `$SYBASE` and `$SYBASE/$SYBASE_ASE`, enter:

   ```
   rm <servername>.*
   ```

2. Change to `$SYBASE/$SYBASE_ASE/install` and run:

   ```
   rm RUN_<servername>.*
   rm <servername>.*
   ```

3. Edit `$SYBASE/interfaces`, to remove all references to the SAP ASE.
4. Remove any operating system files for existing database devices.

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8 Starting and Stopping SAP Control Center

SAP Control Center (SCC) for SAP ASE is a Web-based tool for monitoring the status and availability of SAP ASE servers. Set the $SYBASE environment variables and start an SCC agent on your SAP ASE server.

Prerequisites

Before starting SAP Control Center, make sure you have installed both:

- SCC agent for SAP ASE – a remote command and control agent that runs on a managed server, and which is required to manage SAP ASE tasks within SCC.
- SCC Management User Interface for SAP ASE – provides the GUI that allows you to manage and monitor activities in an SAP ASE server using a Web browser.

A "typical" installation includes the SCC agent, but the management UI is available only if you select the "custom" installation option.

Context

There are several ways to run SCC:

- From the command line in the foreground
- From the command line in the background
- Set up a daemon to run it as a service

Use these steps to run SAP Control Center for the first time and to verify the installation. For complete instructions, see *Get Started* > *Launching SAP Control Center* > *Starting and Stopping SAP Control Center* in the SCC online help, as well as *Starting and Stopping SAP Control Center in UNIX* in the *SAP Control Center Installation Guide*.

Procedure

- To start SAP Control Center:
  a) Before you start the SCC agent for the first time, source either the `SYBASE.csh` or `SYBASE.sh` environment script.
  b) Start the SCC agent:

     ```
     $SYBASE/SCC-3_3/bin/scc.sh
     ```

  c) Verify that the SCC agent is running. After you run the SCC script, you see the SCC console prompt. At this prompt, enter:

     ```
     scc-console> status
     ```


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You should see a status message similar to:

Agent Home: /remote/perf_archive/mymachine/Install_Testing/157CE_C3/SCC-3_3/instances/solstrs3 Connection URL: service:jmx:rmi:///jndi/rmi://solstrs3:9999/agent Status: RUNNING

- To shut SCC down from the console:

```
scc-console> shutdown
```

Related Information

Managing SAP ASE with SAP Control Center [page 10]

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9 Postinstallation Tasks

After you install the server, set it up.

The SAP ASE installation includes directories that contain sample client library applications. These sample programs are included for training purposes only and are not intended to be installed in a production environment.

If you are setting up a production environment, remove these directories:

- `$SYBASE/OCS-16_0/sample`
- `$SYBASE/DataAccess*/ODBC/samples`
- `$SYBASE/jConnect-16_0/sample2`
- `$SYBASE/jConnect-16_0/classes/sample2`
- `$SYBASE/ASE-16_0/sample`
- `$SYBASE/WS-16_0/samples`

Related Information

Installing Sample Databases [page 56]

9.1 Verifying That Servers are Running

Verify that the servers are running.

Prerequisites

Before starting the server, make sure you have stopped, then started the services related to the server.

Context

If you have already started the server, do not run the command a second time. Running it more than once can cause problems.

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Procedure

1. From a UNIX command line, set the environment variables.
   - In the C shell:

     ```
     source <ASE_install_location>/SYBASE.csh
     ```
   - In the Bourne shell:

     ```
     <ASE_install_location>/SYBASE.sh
     ```
2. Show all SAP ASE-related processes that are on the system:

   ```
   $SYBASE/$SYBASE_ASE/install/showserver
   ```

9.2 Verifying Your Connection to the Servers

Use `isql` to verify your connection to the servers.

Context

1. At the command prompt, enter the following:

   ```
   isql -Usa -P<password> -S<server_name>
   ```

   Where:
   - **<password>** – is the password for sa.
   - **<server_name>** is the SAP ASE server name.

   You see the `isql` prompt if the login is successful.
2. At the `isql` prompt, enter:

   ```
   1> select @@version
   2> go
   ```

   The output should show that you are at the current version and edition of SAP ASE.
   If you encounter errors, see the *Troubleshooting Guide*.

9.3 Test the Installation and Network Connections

After installing SAP ASE, SAP Control Center, and the Java Runtime Environment, test the installation and network connections. The SAP ASE server communicates with other SAP ASE servers, Open Server applications

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(such as Backup Server), and client software on your network. Clients can talk to one or more servers, and servers can communicate with other servers using remote procedure calls.

For SAP Control Center to work, install both the SCC agent for SAP ASE as well as the SCC Management User Inserface for SAP ASE. A "typical" installation includes the agent, while the SCC Management User Interface for SAP ASE is available only if you select the "custom" installation option. See the *SAP Control Center Installation Guide* for details about installing and setting up SCC.

For Sybase products to interact with one another, each product must know where the others reside on the network. Sybase stores this information in the `interfaces` file on Windows or in a Lightweight Directory Access Protocol (LDAP) server.

Follow the instructions in *SAP Control Center for Adaptive Server Enterprise* to launch SCC and configure the SAP ASE server for monitoring. You can then view a list of monitored servers in the Administration Console of the Perspective Resources view in SCC to verify your connections.

9.3.1 Configuring libtcl.cfg for LDAP

Use the `libtcl.cfg` file to specify an LDAP server name, port number, directory information tree (DIT) base, user name, and password to connect to an LDAP server.

Context

When you specify an LDAP server in the `libtcl.cfg` file, the server information becomes accessible only from the LDAP server; the `interfaces` file is ignored. Open Client and Open Server applications that use the `-I` option at start-up override the `libtcl.cfg` file and use the `interfaces` file. See the *Configuration Guide for UNIX*.

Procedure

1. Configure the `libtcl.cfg` file to use directory services, using any standard ASCII text editor:
   - Remove the semicolon (;) comment markers from the beginning of the LDAP URL lines in the `libtcl.cfg` file under the `[DIRECTORY]` entry.
   - Add the LDAP URL under the `[DIRECTORY]` entry. See the *Configuration Guide for UNIX* for supported LDAP URL values.

   In its simplest form on 32-bit LDAP drivers, the `libtcl.cfg` file is in this format:

   ```
   [DIRECTORY]
   ldap=libsybdldap.dll
   ```


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> **Caution**
>
> Ensure that the LDAP URL is on a single line.

```
ldap=libsybdldap.dll
ldap://<host>:<port>/ditbase??scope??
bindname=username?password
```

For example (entry shown on multiple lines only for readability):

```
[DIRECTORY]
ldap=libsybdldap.dll
ldap://huey:11389/dc=sybase,dc=com??one??
bindname=cn=Manager,dc=sybase,dc=com?secret
```

> **Note**
>
> On Windows x64, the `.dll` file is called `libsybdldap64.dll`.

2. Verify that the appropriate environment variable points to the required third-party libraries. The Netscape LDAP SDK libraries are in `%SYBASE%\%SYBASE_OCS%\dll`.

   The Windows PATH environment variable must include this directory.

9.3.2 Adding a Server to the Directory Service

Use `dsedit` utility to add a server to the directory service.

Procedure

1. From Windows, select *Start* > *Programs* > *Sybase* > *Connectivity* > *Open Client Directory Service Editor*.
2. Select *LDAP* from the list of servers, and click *OK*.
3. Click *Add New Server Entry*, and enter:
   - Server name
   - Security mechanism – (optional) there is a list of security mechanism objct identifiers in `%SYBASE%\ini\objectid.dat`.
4. Click *Add New Network Transport*, and:
   - Select the transport type.
   - Enter the host name.
   - Enter the port number.
5. Click *OK* twice to exit the `dsedit` utility.

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9.4 The System Administrator Password

When you install SAP software, the software creates a system administrator account called "sa," which can use any database on an SAP ASE server, including `master`, with full privileges.

When you log in to the SAP ASE server, you are prompted to set a password for "sa." See the *Security Administration Guide* for more information about passwords.

9.5 Installing Sample Databases

The sample databases, which contain fictitious information, are designed to help you learn how to use SAP ASE. The sample databases are intended for training purposes only. Do not install them in an SAP ASE production environment.

File Name	Description
`installpubs2`	Installs the `pubs2` sample database. This database contains data that represents a publishing operation. Use this database to test your server connections and to learn Transact-SQL. Most of the examples in the SAP ASE documentation query the `pubs2` database. **Note** The `master` device size should be at least 30MB to install the full `pubs2` database, including the `image` data.
`installpubs3`	Installs the `pubs3` sample database. This updated version of `pubs2` uses referential integrity. In addition, its tables are slightly different than the tables used in `pubs2`. Where noted, the SAP ASE documentation uses the `pubs3` database in its examples.
`installpix2`	Installs the `image` data that is used with the `pubs2` database. Run the `installpix2` script after you run `installpubs2`. The `image` data requires 10MB—there are six pictures, two each in the PICT, TIFF, and Sun raster file formats. Run `installpix2` script only to use or test the `image` datatype. SAP does not supply any tools for displaying `image` data; you must use appropriate window graphics tools to display the images after you have extracted them from the database.

Related Information

Postinstallation Tasks [page 52]
Minimally Configuring an SAP ASE Server [page 40]

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9.5.1 Default Devices for Sample Databases

The SAP ASE installation includes scripts for installing the us_english sample database, foreign language sample databases, and the image data associated with the US English `pubs2` sample database on a default device.

These scripts are located in `$SYBASE/$SYBASE_ASE/scripts`.

By default, these scripts install the sample databases on the `master` device. Because the databases use valuable space on the `master` device that is best reserved for system tables—each sample database requires 3MB on a 2KB server, and multiples of 3MB on a 4KB, 6KB, 8KB, and 16KB server on your database device—we recommend that you change the default to a device other than the `master` device.

To change the default location where the scripts install these databases, use `sp_diskdefault`. See *sp_diskdefault* in *Reference Manual: Procedures*. Alternatively, use a text editor to revise the script directly.

9.5.2 Running the Database Scripts

After you determine your default device, run the scripts to install the sample databases.

Prerequisites

Back up the original `installpubs2` and `installpubs3` scripts, in case you have problems with the edited scripts.

Procedure

1. Start SAP ASE.
2. Go to the scripts directory at `$SYBASE/$SYBASE_ASE/scripts`.
3. Use `isql` to log in to the SAP ASE server and run the script:

   ```
   isql -Usa -P*****-S<server_name> -i<script_name>
   ```

   Where:

   - **<server_name>** – is the destination server for the database.
   - **<script_name>** – is the full path to and file name of the script to run.

   For example, to install `pubs2` on a server named VIOLIN, enter:

   ```
   isql -Usa -P***** -SVIOLIN -i $SYBASE/$SYBASE_ASE/scripts/installpubs2
   ```

4. Install the `image` data associated with `pubs2`:

   ```
   isql -Usa -P<password> -S<servername>
     -i$SYBASE/$SYBASE_ASE/scripts/installpix2
   ```


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The `pubs3` database does not use `image` data.

For more information about running these scripts, see the *Configuration Guide for UNIX*.

9.5.3 Installing the interpubs Database

The `interpubs` database is similar to `pubs2`, and contains French and German data.

Prerequisites

Back up the original `installintpubs` script, in case you experience problems with the edited script.

Procedure

1. Set your terminal to display 8-bit characters.
2. Verify that iso_1, iso_15, Roman8, Roman 9, or UTF-8 is installed as either the default character set or as an additional character set.

   The `interpubs` database contains 8-bit characters and is available for use at SAP ASE installations using the ISO 8859-1 (iso_1), ISO 8859-15 (iso_15), Roman 8, or Roman9 (for HP-UX) character set.
3. Determine the type (raw partition, logical volume, operating system file, and so on) and location of the device where you will be storing the `interpubs` database. You will need to provide this information later.
4. Execute the script, using the `-J` flag to ensure that the database is installed with the correct character set:

```
isql -U<sa> -P<password> -S<servername> -Jiso_1 \
 -i $SYBASE/$SYBASE_ASE/scripts/iso_1/installintpubs
```

9.5.4 Installing the jpubs Database

If you installed the Japanese language module with your server, you can run the `installjpubs` script to install `jpubs`, which is a database similar to `pubs2` that contains Japanese data. `installjpubs` uses the EUC-JIS (eucjis), UTF-8 (utf8), or the Shift-JIS (sjis) character sets.

Prerequisites

Copy the original `installjpubs` script, in case you experience problems with the edited script.

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Procedure

1. Set your terminal to display 8-bit characters.
2. Verify that the EUC-JIS, Shift-JIS, or the UTF-8 character set is installed either as the SAP ASE default character set or as an additional character set.
3. Determine the type (raw partition, logical volume, operating system file, and so on) and location of the device where you will be storing the `jpubs` database. You will need to provide this information later.
4. Execute the `installjpubs` script, using the `-J` flag to ensure that the database is installed with the correct character set:

   ```
   isql -U<sa> -P<password> -S<servername> -Jeucjis \
    -i $SYBASE/$SYBASE_ASE/scripts/eucjis/installjpubs
   ```

   ```
   isql -U<sa> -P<password> -S<servername> -Jeucjis \
    -i %SYBASE%\%SYBASE_ASE%\scripts\eucjis\installjpubs
   ```

   or:

   ```
   isql -U<sa> -P<password> -S<servername> -Jsjis \
    -i $SYBASE/$SYBASE_ASE/scripts/sjis/installjpubs
   ```

   ```
   isql -U<sa> -P<password> -S<servername> -Jsjis \
    -i %SYBASE%\%SYBASE_ASE%\scripts\sjis\installjpubs
   ```

   For more information on the `-J` option in `isql`, see the *Utility Guide*.

9.5.5 Maintaining Sample Databases

The sample databases contain a guest user option that allows authorized users to access the database. Guest users have a wide range of privileges, including permissions to `select`, `insert`, `update`, and `delete` user tables.

Context

We recommend that you remove the guest user option from user databases in production systems. For more information about the guest user and a list of guest permissions, see the *System Administration Guide*.

Procedure

- If possible, and if space allows, give each new user a clean copy of the sample databases so that he or she is not confused by other users' changes.
- If space is a problem, instruct users to issue the `begin transaction` command before updating a sample database.

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- After users have finished updating one of the sample databases, instruct them to issue the `rollback transaction` command to undo the changes.

9.6 Raw Partitions on Linux

You can create and mount database devices on raw bound devices for raw disk I/O. Raw disk I/O enables direct memory access from your address space to the physical sectors on the disk, while omitting needless memory copy operations from the user address space to the kernel buffers.

Raw disk I/O assumes that logical and physical I/O are simultaneous, and that writes are guaranteed to flush to the disk when the system `write` call returns. When preparing a raw partition device, follow these guidelines:

- Do not initialize a database device on the partition that contains your installation software. Doing so destroys all existing files on that partition.
- A raw partition designated for use by by any other software application cannot be mounted for use by the operating system for any other purpose, such as for file systems or swap space.
- After a configuration utility or the `disk init` command has initialized a portion of a partition as a database device, the entire partition cannot be used for any other purpose. Any space left on the partition beyond the size specified for the device can be reused with the `disk resize` command.
- To avoid any possibility of using a partition that contains the partition map, do not use cylinder 0.
- Place the database device on a character device, because the server recovery system needs unbuffered system I/O.
- To determine whether a device is a block device or a character device, run:

```
ls -l <device path>
```

9.6.1 Choosing a Raw Partition

Select a raw partition on which to create and mount database devices.

Procedure

1. Determine which raw partitions are available.
2. Determine the sizes of the raw partitions.
3. From the list of available raw partitions, select a raw partition for each device.
4. Verify with the operating system administrator that the partition you have chosen is available.
5. Make sure the "sybase" user has read and write privileges to the raw partition.

> **Note**
>
> For more information on choosing a raw partition, see your operating system documentation.

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9.6.2 Examples for Creating Raw Partitions

Specific system administration is required before you can enable and use raw devices. The available tools to configure devices depend on the distribution configuration.

You must allocate physical disk space in partitions on the disks where you want to set up raw devices. The physical I/O subsystem can be on either SCSI or EIDE devices.

Note

You can create partitions with the Linux default `fdisk(8)` utility. You must have root privileges to use the command `fdisk`. See the `fdisk(8)` man pages for a complete description of the command.

Example

This example shows how to set up partitions as raw devices, on four SCSI disks in the system—`sda`, `sdb`, `sdc`, and `sdd`.

1. Start `fdisk` on `/dev/sdd`:
   `# fdisk /dev/sdd`
   The system returns:

```
The number of cylinders for this disk is set to 8683
....
Command (m for help):
```

2. Enter **`p`** to print the current partition layout. The output is:

```
Disk /dev/sdd: 64 heads, 32 sectors, 8683 cylinders
Units = cylinders of 2048 * 512 bytes
Device Boot Start   End   Blocks  Id  System
/dev/sdd1       1  7499  7678960  83  Linux
/dev/sdd2    7500  8012   525312  82  Linux swap
/dev/sdd4    8013  8683   687104   5  Extended
```

Example

This example shows the extended partition (`sdd4`) has 687,104 free blocks, starting from 8013 and ending at 8683. You can assign the remaining partitions later. This example assigns an additional partition for raw bound disk I/O:

1. Use the `n` command to create a new partition, and enter **`l`** (for "logical") at this prompt:

```
Command (m for help): n
Command action
l  logical (5 or over)
p  primary partition (1-4)
```

2. Accept the default by pressing *Enter* when you see:

```
First cylinder (8013-8683, default 8013):
```

3. Accept the default by pressing *Enter* again, when you see:

```
Last cylinder or +size or +sizeM or +sizeK
(8013-8683, default 8683): 8269
```


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4. Use the `t` command, enter **5** at this prompt:

   ```
   Partition number (1-8): 5
   ```

5. Enter **60** at this prompt:

   ```
   Hex code (type L to list codes): 60
   ```

   The output is:

   ```
   Changed system type of partition 5 to 60 (Unknown)
   ```

6. Repeat steps 1–5 to create four partitions for raw device I/O.
7. Verify the setup using `p` to print the full partition table before writing it out. Make sure that there are no overlapping partitions and the type for the unassigned partitions is Unknown type 60.

You can now write this partition table to disk and quit the `fdisk(8)` utility.

9.6.3 Administering Raw Devices

Administer raw disk partitions using a plain text file that contains comments and examples for possible configurations.

Procedure

- If you are using a Red Hat Enterprise Linux system running release 3 or 4:
  a) Administer the partitions using the `/etc/sysconfig/rawdevices` file:

  ```
  # raw device bindings
  # format: <rawdev> <major> <minor
  >#         <rawdev> <blockdev>
  # example: /dev/raw/raw1 /dev/sda1
  #          /dev/raw/raw2 8 5
  /dev/raw/raw1 /dev/sdd1
  /dev/raw/raw2 /dev/sdd2
  /dev/raw/raw3 /dev/sdd3
  /dev/raw/raw4 /dev/sdd4
  ```

  b) Create the raw devices.
  c) Bind the raw devices by starting them from `/etc/rc.d/init.d/rawdevices`:

  ```
  [root@legolas init.d]# cd /etc/rc.d/init.d
  [root@legolas init.d]# sh rawdevices start
  Assigning devices:
  /dev/raw/raw1  -->   /dev/sdd5
       /dev/raw/raw1:     bound to major 3, minor 5
  /dev/raw/raw2  -->   /dev/sdd6
       /dev/raw/raw2:     bound to major 3, minor 6
  /dev/raw/raw3  -->   /dev/sdd7
       /dev/raw/raw3:     bound to major 3, minor 7
  /dev/raw/raw4  -->   /dev/sdd8
       /dev/raw/raw4:     bound to major 3, minor 8
  done
  ```


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d) To make sure the raw device binding runs whenever you restart the system, enter:

```
# /sbin/chkconfig rawdevices on
```

- If you are using Red Hat Enterprise Linux system running release 5 or later, modify the `/etc/udev/rules.d/60-raw.rules` file:

```
# Enter raw device bindings here.
#
# An example would be:
#   ACTION=="add", KERNEL=="sda", RUN+="/bin/raw /dev/raw/raw1 %N"
# to bind /dev/raw/raw1 to /dev/sda, or
#   ACTION=="add", ENV{MAJOR}=="8", ENV{MINOR}=="1", RUN+="/bin/raw /dev/raw/
raw2 %M %m"
# to bind /dev/raw/raw2 to the device with major 8, minor 1.
ACTION=="add", KERNEL=="sdb5", OWNER=="sybase",RUN+="/bin/raw /dev/raw/raw1 %N"
ACTION=="add", KERNEL=="sdb6", OWNER=="sybase",RUN+="/bin/raw /dev/raw/raw2 %N"
ACTION=="add", KERNEL=="sdb7", OWNER=="sybase",RUN+="/bin/raw /dev/raw/raw3 %N"
```

- If you are using SuSE:

  a) Modify the `/etc/raw` file:

```
# /etc/raw
#
# sample configuration to bind raw devices
# to block devices
#
# The format of this file is:
# raw<N>:<blockdev>
#
# example:
# ---------
# raw1:hdb1
#
# this means: bind /dev/raw/raw1 to /dev/hdb1
#
# ...
raw1:sda7
raw2:sda8
raw3:sda9
```

  b) Bind the raw devices by starting them with the script `/etc/init.d/raw`:

```
# cd /etc/init.d
# sh raw start
bind /dev/raw/raw1 to /dev/sdb1... done
bind /dev/raw/raw2 to /dev/sdb2... done
bind /dev/raw/raw3 to /dev/sdb3... done
...
```

  c) To make sure the raw device binding runs whenever you restart the system, enter:

```
# /sbin/chkconfig raw on
```


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9.6.4 Accessing Raw Devices from the Server

After you create partitions and bind the devices for raw disk I/O, Adaptive Server can use them.

Prerequisites

Confirm that you have root privileges to execute the raw `-qa` command on your system to avoid seeing a message similar to:
Cannot open master raw device '/dev/rawctl' (Permission denied)

Context

If the SAP ASE server is running as user "sybase," then apply read, write, and owner permissions to the `/dev/raw/raw#` device entries and the raw bound control device `/dev/rawctl`. See the `chown(1)`, `chgrp(1)`, and `chmod(1)` commands to apply correct permissions.

Procedure

1. Verify your settings by querying the device binding with the `raw` command:

   ```
   # raw -qa
   ```

   You should see:

   ```
   /dev/raw/raw1: bound to major 3, minor 5
   /dev/raw/raw2: bound to major 3, minor 6
   /dev/raw/raw3: bound to major 3, minor 7
   /dev/raw/raw4: bound to major 3, minor 8
   ```

2. Using the raw devices, SAP ASE and the installation and configuration utility, `srvbuild`, detect and present size automatically. Enter the absolute path to the raw device when creating devices such as `master`, `sybsystemprocs`, `sybtempdb`.

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10 SAP ASE Upgrades

You can upgrade to SAP ASE version 16.0 from versions 12.5.4 or later.

Upgrades are supported only between nonclustered editions of SAP ASE. You cannot upgrade from SAP® Adaptive Server Enterprise® Cluster Edition to a nonclustered edition.

You can upgrade to SAP ASE version 16.0 from versions 12.5.4, 15.0 through 15.7 by executing the upgrade sequence from the same node on which the database resides. This is a major upgrade, and requires that you perform preupgrade tasks.

You can upgrade from a 32-bit version to a 64-bit version.

You cannot upgrade to this version of SAP ASE from:

- Version 11.9.x
- Version 12.0.x

If you are running either of these versions, upgrade first to version 12.5.4 before upgrading to version 16.0.

If your server has replicated databases, consult the *Replication Server Configuration Guide* before starting the upgrade preparatory tasks.

Only upgrades to and from the same page size are supported. Use `sybmigrate` to re-create the schema and load data from one page size to another. See the *Utility Guide*.

SAP ASE version 16.0 includes both new and changed system catalogs that may affect your existing applications. See the *SAP Adaptive Server Enterprise New Feature Guide* for a complete list.

> ⚠ Caution
>
> Once you upgrade to SAP ASE 16.0, you cannot revert back to an earlier version.

Related Information

Installing SAP ASE in GUI Mode [page 35]
Minimally Configuring an SAP ASE Server [page 40]

10.1 Considerations When Upgrading from SAP ASE 15.0.x or Earlier

A minor change was made to the format of a log record in SAP ASE version 15.5 that introduces an unlikely possibility for the SAP ASE server to misinterpret this changed log record in cases where the upgraded server contains a database that is the primary database for replication. This change should not affect your upgrade process; however, it requires you to strictly follow some steps when you move from SAP ASE 15.0.x or earlier to SAP ASE 15.5.x and later (nonclustered editions). See the following table for all possible combinations of upgrades.

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An upgrade is done by:

- Upgrading your entire installation by switching binaries.
- Upgrading a single database using `online database`, having first loaded it with a database dump and transaction logs taken on a server with an earlier version.

Table 6: Upgrading Your Entire Installation

Current Version	Upgrading to	Special Upgrade Information
SAP ASE 15.0.x or earlier	**SAP ASE 16.0**	If you are using Replication Server to replicate one or more databases in the version to be upgraded, ensure that all transactions have been replicated before the polite shutdown is done, by draining the log. See *Upgrading ASE in a Replication System* and *Upgrading Replication Server* in the *Replication Server Configuration Guide* for your platform.
SAP ASE Cluster Edition 15.5.x or later	**SAP ASE 16.0**	Upgrading any version of SAP ASE Cluster Edition to a nonclustered version is not supported.
SAP ASE 15.5.x	**SAP ASE 16.0**	No special upgrade instructions.

Table 7: Upgrading a Single Database

Current Version	Upgrading to	Special Upgrade Instructions
SAP ASE 15.0.x and earlier	**SAP ASE 16.0**	When you use `online database` to upgrade a single database in SAP ASE 16.0 (either the cluster or noncluster edition) after loading a database dump and transaction logs from SAP ASE 15.0.x or earlier, if the database you are upgrading is also replicated, make sure the database's transaction log is truncated before you turn replication back on.
SAP ASE Cluster Edition 15.5.x or later	**SAP ASE 16.0**	Upgrading a database from any version of the Cluster Edition to a nonclustered version is not supported.
SAP ASE 15.5.x	**SAP ASE 16.0**	No special upgrade instructions.

Related Information

Reenabling Replication Server After the Dataserver Upgrade [page 86]
Postupgrade Tasks [page 83]

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10.2 Considerations for Component Integration Services

If you have both a local and a remote server running on SAP ASE version 15.x and are upgrading both of them to version 16.0, upgrade the local server first. If you plan to upgrade one server but not the other, upgrade the local server.

SAP does not certify that Component Integration Services running on earlier versions of SAP ASE can connect to later versions. You may encounter errors if an earlier version of SAP ASE maps a proxy table to a later version and if the remote table uses functionality that is unavailable in the earlier version.

SAP certifies that each version of SAP ASE connects to earlier versions through Component Integration Services. Component Integration Services is tested and certified to connect to earlier versions of SAP ASE.

10.3 Preparing to Upgrade

Use the `preupgrade`, `upgrade`, `sqlupgrade`, and `sqlupgraderes` utilities to upgrade SAP ASE versions earlier than 16.0.

Prerequisites

> ⚠ Caution
>
> Since it is not possible to downgrade once you upgrade to SAP ASE 16.0, make sure to back up all databases, including `master` and other system databases, before beginning the upgrade process.

Context

To perform an upgrade to SAP ASE version 16.0, run the `preupgrade` utility. You must have system administrator privileges to perform an upgrade.

Each new server version contains features that introduce parameters, commands, reserved words, and so on. The `preupgrade` utility prepares the old server by making sure all necessary directories and settings are correct for the upgrade. When running the `preupgrade` utility, manually stop and start the server. You need not start the server before running the `sqlupgrade` upgrade utility; the utility starts the server when needed.

If you are upgrading from:

- Version 12.5.4 with cache bindings on `sybsystemdb` – drop the cache bindings for `sybsystemdb` that are bound to a user-defined cache before you run the `preupgrade` utility.
- Earlier than version 16.x but later than 12.5.4 – from the SAP ASE 16.0 installation directory, use the `preupgrade` utility to perform the preupgrade checks on the old server. The utility is located in `$SYBASE/ASE-16_0/bin`.

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Manually drop objects before you execute procedures for the first time. The first time you run the server after an upgrade, the server internally rebuilds procedures from the text in `syscomments`. The procedure may not execute properly if it contains code that drops, then re-creates, an existing object.

Procedure

1. Go to the directory where your current version of SAP ASE is installed.
2. Enter `cd in` to go to the directory ASE-**<version>**, where **<version>** is your current version of SAP ASE.
3. Perform `cd in` to the `bin` directory.
4. Enter `preupgrade` to run the `preupgrade` utility.

10.4 Changes in SAP ASE Directories

The directory structures for SAP ASE installations differ, depending on version.

Directory Changes

Component	Location
SAP ASE	• 12.5.4 location – `$SYBASE/ASE-12_5` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 locations – `$SYBASE/ASE-15_0` • 16.0 location – `$SYBASE/ASE-16_0`
SQL Central	• 12.5.4 and 15.0.2 locations – `$SYBASE/shared/sybcentral43` • 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, locations – `$SYBASE/shared/sybcentral600`
SCC	• 15.7 SP100 – `$SYBASE/SCC-3_2` • 16.0 – `$SYBASE/SCC-3_3`
JRE	• 12.5.4 location – `$SYBASE/shared/jre142` • 15.0.2 location – `$SYBASE/shared/jre142_*` • 15.0.3 location – `$SYBASE/shared/JRE-6_0*` • 15.5, 15.7 GA, and 15.7 ESD #1 locations – `$SYBASE/shared/JRE-6_0*` • 15.7 ESD #2, ESD #3, and SP100 locations – `$SYBASE/shared/JRE-7_0*` • 16.0 location – `(32-bit) $SYBASE/shared/SAPJRE-7_1_*_32BIT` and (64-bit) `$SYBASE/shared/SAPJRE-7_1_*_64BIT`

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Component	Location
Language settings (`locales`)	• 12.5.4 and 15.0.2 locations – `$SYBASE/locales` • 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 locations – `$SYBASE/locales` and `$SYBASE/ASE-15_0/locales` • 16.0 location – `$SYBASE/locales` and `$SYBASE/ASE-16_0/locales`
Connectivity	• 12.5.4 location – `$SYBASE/OCS-12_5` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 locations – `$SYBASE/OCS-15_0` • 16.0 location – `$SYBASE/OCS-16_0`
Web Service	• 12.5.4 location – `$SYBASE/WS-12_5` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 locations – `$SYBASE/WS-15_0` • 16.0 location – `$SYBASE/WS-16_0`
SySAM	• 12.5.4 location – `$SYBASE/SYSAM-1_0` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, SP100, and 16.0 locations – `$SYBASE/SYSAM-2_0`
Job Scheduler	• 12.5.4 location – `$SYBASE/JS-12_5` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 locations – `$SYBASE/ASE-15_0/jobscheduler` • 16.0 location – `$SYBASE/ASE-16_0/jobscheduler`
Unified Agent	• 15.0.2 and 15.0.3 locations – `$SYBASE/UAF-2_0` • 15.5, 15.7 GA locations – `$SYBASE/UAF-2_5` • 15.7 ESD #1, ESD #2, ESD #3, and SP100 locations – `$SYBASE/SCC-3_2` • 16.0 location – No longer shipped. Included with SCC.

10.5 Preupgrade Tasks

To ensure a successful upgrade, review and perform preparatory tasks as necessary. Depending on the old server configuration, you may not need to perform all preparatory tasks.

Prerequisites

- You need the master and system procedures files to upgrade the server. By default, the `master` (`master.dat`) and system procedures device (`sybsytemprocs.dat`) files are in the `$SYBASE/data` directory.
- The previously installed version of the server must be running. If you are upgrading Backup Server, Historical Server, or XP Server, those servers must not be running.

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Context

> **Note**
>
> Follow these steps only if you are performing a major upgrade from an SAP ASE version earlier than 16.0.

Skip these preparatory tasks if you plan to use `sqlupgrade`, which performs these tasks automatically.

Procedure

1. Install SAP ASE 16.0 into the old ASE directory.
2. Check system and upgrade requirements.
3. Ensure that the directory to which your TEMP environment variable points exists.
4. Verify the name and location of the `runserver` file, and that you have renamed it to `RUN_<servername>` as it appears in the `interfaces` file, where `<servername>` is the name of the old server.

   The default `RUN_<servername>` file for a server called SYBASE is `RUN_SYBASE`. If the `RUN_<servername>` file for your current server is named differently, use the actual name of your server during the upgrade process.
5. Verify that the text of all stored procedures you upgrade is available in `syscomments` by either:
   - Reinstalling the procedures with text, or,
   - Removing and reinstalling the procedures after the upgrade.

   This step can allow you to inspect the stored procedures for any hidden or unwanted text.
6. Make sure reserved words use quoted identifiers.
7. Verify that users are logged off.
8. Use `dbcc` to check for database integrity.
9. Back up databases.
10. Dump the transaction log.
11. Verify that `master` is the default database for the "sa" user.
12. Prepare the database and devices for upgrade using the `preupgrade` utility. See `preupgrade` in the *Utility Guide* for more information. After `preupgrade` finds no errors by exiting with status 0 (zero):
    a) Create a `sybsystemdb` database if it does not already exist.
    b) Disable auditing by running `sp_configure 'auditing', 0`.
    c) Disable Job Scheduler.
    d) Obtain the current audit settings for the pre-16.0 SAP ASE using `sp_displayaudit`; use this saved information to reenable auditing after you complete the upgrade.
    e) If you made any site-specific changes to the permissions for system stored procedures, obtain the current permission settings for them using `sp_helprotect`; then use this saved information to reenable the permissions after you complete the installation. Pay special attention to
       - Any stored procedures that are not granted execute permission to public, such as `sp_addauditrecord`, `sp_monitor`, and `sp_sysmon`.
       - Any stored procedures where execute permission has been revoked from public.

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f) Disable disk mirroring.
g) Verify that your SYBASE environment variable points to the location of the new server software files you just installed.

Fix any problems that `preupgrade` utility reports.

You can safely ignore any warnings SAP ASE issues about configuration parameters not being set to the default, as these are only for your information.

13. If you are upgrading from a nonclustered 12.5.4, 15.0.2, 15.5, or 15.7 server, and archive database access has been applied in the lower version server, disable the related functionality before upgrading.
14. Ensure that the procedure cache size is at least 150 percent of the default procedure cache size, or between 53,248 and 2,147,483,647 2KB pages.
15. Copy these files from earlier versions of the server to their corresponding SAP ASE 15.x installation locations:
    - `$SYBASE/interfaces`
    - `$SYBASE/$SYBASE_ASE/<servername>.cfg` – where `<servername>` is your server name.
    - `$SYBASE/$SYBASE_OCS/config/libtcl.cfg`
    - `$SYBASE/SYSAM-2_0/licenses/license.lic`
16. If you have enabled the Java in the database feature, create the `sybpcidb` database and disable the feature during the installation.
17. Set the environment variables by sourcing the `SYBASE.[csh, sh, env]` file.

    > **Caution**
    >
    > Do not run the environment variable script more than once.

18. Disable LDAP using:

```
sp_configure 'enable ldap' , 0
```

10.5.1 Upgrade Stored Procedures

If you modified any system stored procedures without altering their names, back them up before you upgrade SAP ASE. The upgrade process overwrites these modified procedures with default versions.

10.5.2 Reserved Words

Reserved words are pieces of SQL syntax that have special meaning when used as part of a command.

Transact-SQL does not allow words that are part of command syntax to be used as identifiers unless they are enclosed in quotation marks. If you are upgrading SAP ASE, you see errors when you run queries, stored procedures, or applications that use these identifiers in your user databases.

> **Note**
>
> Before upgrading, use `sp_renamedb` to change the name of any user database that is a reserved word.

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If you change an object name, also change applications and stored procedures that refer to that object. Conflicts between object names do not prevent the upgrade process from completing. However, applications that refer to conflicting object names may not work after the upgrade. Rename all objects that use reserved words.

As part of the preupgrade process, you can have `sqlupgrade`, `sqlupgraderes`, or `preupgrade` perform a reserved-word check for you. See the *Reference Manual: Building Blocks* for a complete list of reserved words.

10.5.2.1 Running a Reserved Word Check

Run the reserved word check on the SAP ASE server you are upgrading.

Context

Even if you plan to use `sqlupgraderes` to upgrade SAP ASE noninteractively, you can still first run the interactive `sqlupgrade` utility to perform reserved-word checks and other potential upgrade eligibility problems, and then continue with the upgrade if no problems are found.

Both `sqlupgrade` and `sqlupgraderes` automatically install new reserved words and the `sp_checkreswords` system procedure, which detects and displays identifiers in your existing databases that conflict with reserved words in the new database. You can use `sp_checkreswords` at any time while performing preupgrade tasks.

> **Note**
>
> Do not use an older version of `sp_checkreswords` to check for reserved words, as it does not contain the most current list of reserved words.

Procedure

1. Checking for reserved words generates a list of identifiers that conflict with reserved words, and the owners of those identifiers, in the file `$SYBASE/$SYBASE_ASE/init/logs/sqlupgrade<MMDD.nnn>`. Review this file to determine which identifiers to change.
2. The `sqlupgrade` utility installs `sp_checkreswords` and checks the reserved words during the upgrade.

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10.5.2.2 Addressing Reserved Words Conflicts

Change any database names that are reserved words.

Procedure

1. Use `sp_dboption` to set the database to single-user mode, then run `sp_renamedb`, specifying the new name.
2. If other identifiers are reserved words, you can use:
   - `sp_rename` to change the name of the object, before or after the upgrade.
   - Quoted identifiers.
   - Brackets around the identifier. For example:

     ```
     create table [table] ( [int] int, [another int] int )
     ```
3. Run `sp_checkreswords` in `master` and in each user database to display the names and locations of conflicting identifiers.

   See *Reference Manual: Procedures* for information about `sp_dboption`, `sp_rename`, and `sp_checkreswords`.

10.5.2.3 Quoted Identifiers

To avoid reserved word conflicts, all users on the server must invoke the `quoted_identifier` option in all stored procedures and queries that include the reserved words.

To invoke the `quoted_identifier` option of the `set` command in procedures and queries that include the reserved words, enclose the reserved words that are identifiers in double quotation marks. The `set quoted_identifier` option tells SAP ASE to treat any character string enclosed in double quotation marks as an identifier.

See *Reference Manual: Commands* for more information on `set quoted_identifier`.

10.5.3 Preparing the Database and Devices

Before starting the upgrade process, confirm that you have enough space for the upgrade to succeed.

Procedure

1. To calculate the free space required for the upgrade to succeed, double the size of the largest catalog that you are going to upgrade, then add approximately 10 percent. For example, if you have a large number of

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stored procedures or compiled objects in any database, the `syscomments` and `sysprocedures` system tables require additional space.

The `preupgrade` utility scans the system catalogs and performs this calculation automatically.

2. If you are:
   - Not using two-phase commit or distributed transaction management (DTM) applications, create a `sybsystemdb` with a minimum of 4MB if it does not already exist.
   - Using two-phase commit or DTM, create either:
     - A minimum-sized `sybsystemdb` for upgrade and expand it later, or
     - A `sybsystemdb` of 5MB to 20MB, depending on your expected usage. Approximately 25 percent of the database should be data storage, and 75 percent should be log storage.
3. If it does not already exist, create the `sybsystemdb` database. Servers that use a 2KB logical page size require a `sybsystemdb` that is at least 4MB. Servers that use a larger logical page size require a `sybsystemdb` that is at least as large as the `model` database:

```
1> create database sybsystemdb on default = '4M'
2> go
1> use sybsystemdb
2> go
1> sp_create_syscoordinations
2> go
```

   SAP ASE uses this database for tracking transactions, and during recovery. It is also used by applications using two-phase commit and DTM.
4. Verify that the `sybsystemdb` database is large enough. For an upgrade, the default size for `sybsystemdb` is 124MB, or enough free space to accommodate the existing `sybsystemdb` database, and the largest catalog that is to be upgraded, plus 10 percent for logging upgrade changes. You may need more space if you are adding user-defined stored procedures.
5. If you use Java in the database, the `preupgrade` utility detects that you set `sp_configure "enable java"` to `1`, and requests that you enable PCI and configure `sybpcidb` before you upgrade the server.
6. Increase the default database size:
   a) Use `alter database` to increase the size of the `master` database.
   For example:

```
1> alter database tempdb on master=<X>
2> go
1> alter database model on master=<X>
2> go
```

   <X> is the megabytes of space you are adding.

   Repeat this process for each temporary and `model` databases, making sure that `model` is at no point larger than `tempdb`.

   b) Use `sp_helpdb` to verify the size of each system database you increase in size.
   c) Use `sp_configure` to update the values as indicated by the `preupgrade` utility.
   This example updates the number of locks available for all users on the SAP ASE server to 6,000:

```
sp_configure "number of locks", 6000
```


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10.5.4 The sybprocsdev device

Sybase system procedures are stored in the `sybsystemprocs` database, which is stored in the `sysprocsdev` device. You may need to increase the size of `sysprocsdev` before upgrading SAP ASE.

Regardless of page size, when configuring a new server, the size of `sybsystemprocs` is:

- Minimum – 184 MB
- Default – 196 MB

For upgrades, you need an additional 10 percent of this.

You may need more space if you are adding user-defined stored procedures.

If your `sybsystemprocs` database does not meet these requirements and you have enough room on the device to expand the database to the required size, use the `alter database` command to increase the database size.

Use:

- `sp_helpdb` to determine the size of the `sybsystemprocs` database:

```
1> sp_helpdb sybsystemprocs
2> go
```

- `sp_helpdevice` to determine the size of the `sysprocsdev` device:

```
1> sp_helpdevice sysprocdev
2> go
```

If the **<db_size>** setting is less than the required minimum, increase the size of `sysprocdev`.

10.5.4.1 Increasing the Size of the sybsystemprocs Database

Create a new database with sufficient space if your current `sybsystemprocs` database does not have the minimum space required for an upgrade. The minimum size of `sybsystemprocs` is 184MB; the recommended size is 196MB.

Prerequisites

Create a current backup of your old database.

Context

Although you can drop the old database and device and create a new `sysprocsdev` device, SAP recommends that you leave the old database and device and add a new device that is large enough to hold the additional memory, and alter the `sybsystemprocs` onto the new device.

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Procedure

1. In `isql`, use `alter database` to increase the size of the `sybsystemprocs` database. For example:

   ```
   1> use master
   2> go
   1> alter database sybsystemprocs on sysprocsdev=40
   2> go
   ```

   In this example, "sysprocsdev" is the logical name of the existing system procedures device, and 40 is the number of megabytes of space to add. If the system procedures device is too small, you may receive a message when you try to increase the size of the `sybsystemprocs` database.

   If there is space available on another device, expand `sybsystemprocs` to a second device, or initialize another device that is large enough.
2. Verify that the SAP ASE server has allocated more space to `sybsystemprocs`:

   ```
   1> sp_helpdb sybsystemprocs
   2> go
   ```

Results

When the database is large enough to accommodate the increased size of `sybsystemprocs`, continue with the other preupgrade tasks.

10.5.4.2 Increasing Device and Database Capacity for System Procedures

If you cannot fit the enlarged `sybsystemprocs` database on the system procedures device, increase the size of the device and create a new database. The minimum size of `sybsystemprocs` is 184MB; the recommended size is 196MB.

Prerequisites

This procedure removes all stored procedures you have created at your site. Before you begin, save your local stored procedures using the `defncopy` utility. See the *Utility Guide*.

Context

This procedure involves dropping the database. For more information on `drop database`, see the *Reference Manual*.

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Procedure

1. Determine which device you must remove:

```
select <d.name>, <d.phyname>
from sysdevices d, sysusages u
where u.vstart between d.low and d.high
and u.dbid = db_id("sybsystemprocs")
and d.status & 2 = 2
and not exists (select vstart
    from sysusages u2
    where u2.dbid != u.dbid
    and u2.vstart between d.low and d.high)
```

   Where:

   - **< d.name>** – is the list of devices to remove from `sysdevices`.
   - **< d.phyname>** – is the list of files to remove from your computer.

   The `not exists` clause in this query excludes devices that are used by `sybsystemprocs` and other databases.

   Make a note of the names of the devices to use in subsequent steps.

   > **Caution**
   >
   > Do not remove any device that is in use by a database other than `sybsystemprocs`, or you will destroy that database.

2. Drop `sybsystemprocs`:

```
1> use master
2> go
1> drop database sybsystemprocs
2> go
```

   > **Note**
   >
   > In versions earlier than 15.x, use `sysdevices` to determine which device has a low through high virtual page range that includes the `vstart` from step 2.
   >
   > In version 15.x, select the **<vdevno>** from `sysusages` matching the **<dbid>** retrieved in step 1.

3. Remove the device:

```
1> sp_configure "allow updates", 1
2> go
1> delete sysdevices
    where name in ("<devname1>", "<devname2>", ...)
2> go
1> sp_configure "allow updates", 0
2> go
```

   The `where` clause contains the list of device names returned by the query in step 1.

   > **Note**
   >
   > Each device name must have quotes. For example, "`devname1`", "`devname2`", and so on.

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If any of the named devices are OS files rather than raw partitions, use the appropriate OS commands to remove those files.

4. Remove all files that were returned in the **<d.phyname>** list.

   > **Note**
   >
   > File names cannot be complete path names. If you use relative paths, they are relative to the directory from which your server was started.

5. Find another existing device that meets the requirements for additional free space, or use a `disk init` command similar to the following to create an additional device for `sybsystemprocs`, where `/sybase/work/` is the full, absolute path to your system procedures device:

   ```
   1> use master
   2> go
   1> disk init
   2> name = "sysprocsdev",
   3> physname = "/sybase/work/sysproc.dat",
   4> size = 200M
   5> go
   ```

   > **Note**
   >
   > Server versions 12.0.x and later accept, but do not require `"vdevno=number"`. For information about determining whether `vdevno` is available, see the *System Administration Guide.*

   The size you provide should be the number of megabytes of space needed for the device, multiplied by 512. `disk init` requires the size to be specified in 2KB pages. In this example, the size is 112MB (112 x 512 = 57344). For more information on `disk init`, see the *Reference Manual: Commands*.

6. Create a `sybsystemprocs` database of the appropriate size on that device, for example:

   ```
   1> create database sybsystemprocs on sysprocsdev = 180
   2> go
   ```

7. In the old server installation directory, enter:

   ```
   isql -Usa -P<password> -S<server_name >-i$SYBASE/ASE-15_0/scripts/installmaster
   ```


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10.6 Upgrade to SAP ASE 16.0

If you are performing a major upgrade from a version earlier than 16.x, you are ready to upgrade SAP ASE after you successfully run the `preupgrade` utility.

10.6.1 Upgrading Interactively Using `sqlupgrade`

Use the interactive `sqlupgrade` tool to upgrade SAP ASE using an X-Windows or Motif GUI.

Prerequisites

Set the OLDSYBASE_ASE variable to the SYBASE_ASE that is appropriate to your older server. If you are upgrading from 15.7 for example, OLDSYBASE_ASE should be `ASE-15_0`.

We recommend that you also set the OLDSYBASE, and OLDSYBASE_OCS environment variables to point to the older version installation of SAP ASE, so the upgrade utility that you run from the new `$SYBASE` directory automatically populates input fields with the correct information as you upgrade.

Source `SYBASE.csh` before running `sqlupgrade` if you have not already so.

Make sure your old server is running. If the server you are upgrading is not running, `sqlupgrade` prompts you to start the server.

Procedure

1. Verify that you have backed up databases, devices, and so on, and click *Next*.
2. Enter:

   ```
   $SYBASE/$SYBASE_ASE/bin/sqlupgrade
   ```

   The available command options for `sqlupgrade` are:

   - `-s` **`<sybase_dir>`** – specifies the value to use for the SYBASE environment variable.
   - `-r` **`<resource_file>`** – executes the specified resource file.
   - `-D` **`<data_directory>`** – specifies a working directory that differs from the default `$SYBASE` directory. This allows users other than the sa to configure and use SAP ASE without the need to have access permission to the `$SYBASE` directory. If you do not use `-D`, SAP ASE uses `$SYBASE` as the default.
   - `-v` – prints the version number and copyright message for `sqlupgraderes` and then exits.
3. In the Specify Sybase Directories dialog, enter:
   - The full path of the new SAP ASE release directory.

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- The full path of the data directory for the new SAP ASE release directory. This field allows you to specify a working directory that differs from the default $SYBASE directory, which allows users other than the sa to configure and use SAP ASE without the need to have access permission to the $SYBASE directory.
- The name of the component directory that contains the new SAP ASE version.
- The full path of the old release directory.
- The name of the component directory that contains the earlier version of SAP ASE.
- The name of the component directory that contains the earlier version of Open Client/Server Library.

Click *OK*.

4. Select the server to upgrade from the list of servers.
5. Enter the password for the sa login, then click *OK*.
6. Specify an upgrade option, then click *OK*. `sqlupgrade` performs a preupgrade review to verify that your current server meets the requirements for upgrade to the new version.

   If your current server fails the preupgrade review, fix the problem based on the information from the results of the test.
7. Click *OK* to upgrade your server.

   You see the Status Output window, which shows the completion status and informational messages about the upgrade process.

   > **Caution**
   >
   > Do not interrupt the upgrade, connect to SAP ASE, or run any stored procedures while the upgrade is in progress.

   You can also check progress by viewing the `sqlupgrade` log in `$SYBASE/$SYBASE_ASE/init/logs/sqlupgrade<MMDD>.<NNN>`, where:

   - **`<MM>`** – is the month.
   - **`<DD>`** – is the date.
   - **`<NNN>`** – is a three-digit number identifying the `sqlupgrade` server upgrade session.

   After all preupgrade checks are successful, `sqlupgrade` shuts the old server down, then starts the new SAP ASE `dataserver` binary on the old `master` device.

Results

When the upgrade succeeds, you can:

- Click *OK* to specify another server to upgrade, or
- Exit `sqlupgrade` and perform post-upgrade tasks.

The upgrade process:

- Creates the `RUN_servername` file, which contains the information required to restart the server
- Runs the `installmaster` script to create system procedures

To verify that the upgrade was successful, log in to the server and run:

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- `select @@version` – SAP ASE should return `16.0`.
- `sp_configure "upgrade version"` – SAP ASE should return `16000000` (16 million).

10.6.2 Upgrading Noninteractively Using `sqlupgraderes`

You can upgrade SAP ASE without the graphical user interface (GUI), in noninteractive mode by using values from a resource file that defines the attributes for the server to be upgraded.

Prerequisites

Set the OLDSYBASE_ASE variable to the SYBASE_ASE that is appropriate to your older server. If you are upgrading from 15.7 for example, OLDSYBASE_ASE should be `ASE-15_0`.

We recommend that you also set the OLDSYBASE, and OLDSYBASE_OCS environment variables to point to the older version installation of SAP ASE, so the upgrade utility that you run from the new `$SYBASE` directory automatically populates input fields with the correct information as you upgrade.

Source `SYBASE.csh` before running `sqlupgrade` if you have not already so.

Make sure your old server is running. If the server you are upgrading is not running, `sqlupgrade` prompts you to start the server.

Procedure

1. Edit the sample resource file included in your SAP ASE distribution in `$SYBASE/$SYBASE_ASE/init/sample_resource_files`. Use a text editor to edit the resource file.
2. Execute `sqlupgraderes` by entering the following at the UNIX prompt, where **`<resource_file>`** specifies the resource file containing the attributes that describe the server to upgrade:

   ```
   $SYBASE/$SYBASE_ASE/bin/sqlupgraderes -r <resource_file>
   ```

   The available command options for `sqlupgraderes` are:

   - `-s` **`<sybase_dir>`** – specifies the value to use for the SYBASE environment variable. •
   - `-r` **`<resource_file>`** – executes the specified resource file.
   - `-D` **`<data_directory>`** – specifies a working directory that differs from the default $SYBASE directory. This allows users other than the sa to configure and use SAP ASE without the need to have access permission to the $SYBASE directory.
   - `-v` – prints the version number and copyright message for sqlupgraderes and then exits.

   Running the `sqlupgraderes` utility creates a new file containing the values you specified for the upgrade session, and writes it to the `sqlupgradeMMDD.NNN-server_name.rs` file in `$SYBASE/$SYBASE_ASE/init/logs/`.

   Where:

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- **<server_name>** – is the server you are upgrading.
- **<MM>** – is the month.
- **<DD>** – is the date.
- **<NNN>** – is a three-digit number identifying the `sqlupgrade` session.

If the resource file you are modifying was created by `sqlupgrade`, the prefix of the attribute name may vary. `sqlupgraderes` ignores this prefix when processing the resource file. The attributes and their default values are:

- `sybinit.release_directory` – $SYBASE [**<path = _name_of_old_release>**]
- `sybinit.product` – sqlsrv
- `sqlsrv.server_name` – **<server_name>**
- `sqlsrv.new_config` – no default value
- `sqlsrv.sa_login` – **<current_login>**
- `sqlsrv.sa_password` – **<current_password>**
- `sqlsrv.do_upgrade` – Yes
- `sqlsrv.do_reserved_word_check` –Yes

All attributes are required, and all values are case-sensitive.

10.6.3 Manually Upgrading SAP ASE

You can upgrade manually without using a wizard or utility.

Prerequisites

Source `SYBASE.csh` to set up the environment variables if you have not already done so.

Context

To upgrade SAP ASE manually, use the `upgrade` executable located in `$SYBASE/ASE-16_0/bin`.

Procedure

1. Shut down:
   - The pre-16.0 SAP ASE server
   - All additional servers that are using the same `$SYBASE` directory as the SAP ASE
2. If you installed ASE 16.0 into a directory other than the old ASE directory, copy the server entry from the old `interfaces` file to the new `interfaces` file.

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3. Copy the **<server_name>.cfg** file from old directory to the new `$SYBASE` directory.
4. Start the 16.0 server with the old `master` device from the old server.
5. Restart all the additional servers you shut down after shutting down the pre-16.0 SAP ASE.
6. Run `upgrade`. If problems occur, fix them, and re-run the upgrade process.
7. Reinstall the SAP ASE-supplied stored procedures to prevent any errors caused from changes to the system catalogs.

10.7 Postupgrade Tasks

After you have upgraded, make sure your new SAP ASE server is up and running.

Context

The upgrade process does not cause any changes in existing statistics, so you need not run `update statistics` on any tables after the upgrade. If you are upgrading from SAP ASE version 15.x, however, restart the server to make the statistics available.

Procedure

1. To explicitly re-compile the objects, run `dbcc upgrade_object()` for each database.
2. If you upgraded from SAP ASE version 12.5.2 or earlier, ensure there are no issues with OAM pages by running `dbcc checkcatalog` with the `fix` option:

   ```
   dbcc checkcatalog (<database_name>, fix)
   ```
3. If you have any system stored procedures that you had saved from before the upgrade (because you had modified them without altering their names), reload them now.
4. Execute:

   ```
   dbcc gam (<dbname>,0,0,'check')
   ```

   This command performs upgrade operations on `text` and `image` columns that are deferred during the SAP ASE upgrade process, and prevents `dbcc checkstorage` from taking a long time when it is run for the first time after the upgrade.

Related Information

Considerations When Upgrading from SAP ASE 15.0.x or Earlier [page 65]
How Compiled Objects Are Handled When Upgrading SAP ASE [page 99]

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10.7.1 Restoring Functionality in SAP ASE After Upgrading

Restore functionality in the server after an upgrade.

Procedure

1. If you changed any configuration parameters before upgrading, use `sp_configure` to set them back to their earlier values.
2. Use `sp_dboption` to reset any database options you disabled before upgrading.
3. Before you use the upgraded server, verify that all custom scripts point to SAP ASE 16.0.
4. Verify procedure cache allocation. The size should be the same as before upgrading, unless the original size was smaller than the default value.
5. Check the procedure cache requirements. Version 16.0 stored procedures, triggers, and other compiled objects require much more memory to run than earlier versions.

   Use `sp_configure` to increase the `procedure cache size` during runtime, and `sp_configure verify` to verify any changes you make to the configuration file without having to restart SAP ASE:

   ```
   sp_configure "configuration file", 0, "verify", "<full_path_to_file>"
   ```

   See *Reference Manual: Procedures* and the *Performance and Tuning Guide* for details about `sp_configure` and `sp_sysmon`, and the *System Administration Guide* for information about configuring memory.
6. Verify data cache allocation.

   During the upgrade process, the server ensures that the default data cache size remains the same. Therefore, during the preupgrade process before the upgrade, the size of the default data cache is obtained and written to the configuration file as an absolute value, not as a default. This enables the server to have the same default data cache size as before the upgrade. If this size is less than the default size of 8MB, the server allocates a default data cache of 8MB.
7. If you unmirrored devices, remirror them using the `disk remirror` command.
8. If you used compiled objects, see *How Compiled Objects Are Handled When Upgrading SAP ASE* [page 99].
9. If you used two-phase commit in the earlier version of SAP ASE, run the script to install the two-phase commit tables:

   ```
   isql -U<sa> -P<sa_password> -S<server_name>
     -i$SYBASE/$SYBASE_ASE/scripts/installcommit
   ```

Related Information

How Compiled Objects Are Handled When Upgrading SAP ASE [page 99]

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10.7.2 Reenabling Auditing

If the server you upgraded from was configured for auditing, reenable auditing in the upgraded server.

Procedure

1. Enter:

   ```
   sp_configure 'auditing', 1
   ```

2. Reenable auditing for all system stored procedures for which auditing was enabled before the upgrade.
   a) Use the output of `sp_displayaudit` recorded during the preupgrade process to identify the system stored procedures for which auditing was enabled.
   b) Reenter the audit options using `sp_audit`. For example, if you had enabled stored procedure auditing for `sp_addgroup` stored procedure in your server before upgrading, run:

      ```
      sp_audit "exec_procedure", "all", "sp_addgroup", "on"
      ```

10.7.2.1 Updating Threshold Procedures for Audit Segments

An post-upgrade task is required for threshold procedures used to archive audit segments.

If your previous installation used a threshold procedure, similar to this, execute the following to archive the **<sysaudits>** table:

```
INSERT MyPre15SysAuditHistoryTable SELECT * FROM
sysaudits_0n
```

where **<n>** corresponds to the `sysaudits` table number 1–8 and `MyPre15SysAuditHistoryTable` is a table defined prior to version 16.0, then you must alter `MyPre15SysAuditHistoryTable` to add a `nodeid` column using:

```
alter table MyPre15SysAuditHistoryTable
    add nodeid tinyint NULL
```

See the *Reference Manual: Tables* for system tables for details about the `sysaudits` tables.

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10.7.3 Restoring Permissions

If the server you upgraded from had site-specific permissions on system stored procedures, restore those permissions in the upgraded server.

Context

10.7.4 Reenabling Replication Server After the Dataserver Upgrade

If you disabled replication before the upgrade, you must reenable replication.

Procedure

1. Remove older formatted log records from your database.
2. Use the `dump tran` command to dump the database and transaction logs to remove the older format log records from your database. This prevents Replication Agent™ and other log readers from accessing the preupgrade portion of the transaction logs.

   ```
   1> use master
   2> go
   1> dump database sales to dumpdev
   2> go
   1> dump transaction sales with truncate_only
   2> go
   ```

3. Reenable replication.

Related Information

Considerations When Upgrading from SAP ASE 15.0.x or Earlier [page 65]

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10.7.4.1 Restoring Replication on Replicate Databases

Restore replication if you have upgraded a destination-only dataserver in a replication system.

Context

Perform these steps for each replicate database and Replication Server System Database (RSSD).

Procedure

1. Start the SAP ASE server if it is not already running.
2. Log in to the SAP ASE server.
3. If you have zeroed out the locator for the database, go to step 4. Otherwise, stop Replication Server, then run:

```
1> use <RSSD>
2> go
1> rs_zeroltm dataserver, <database>
2> go
```

4. Restart the Replication Servers.
5. Resume the data server interface (DSI) connections that were suspended before the upgrade by executing the following Replication Server command for each suspended database:

```
1> resume connection to dataserver.<database>
2> go
```

Results

The replication system is now ready for SAP ASE 16.0, and applications can resume.

If you installed any SAP ASE-related client products, such as Open Client, use the `dsedit` utility to edit your `interfaces` file and to specify the servers to which you want to connect.

For more information about establishing client/server connections, see the *Open Client Configuration Guide*.

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10.7.4.2 Restoring Replication on Primary Databases

Restore replication if you have upgraded a source database, or primary database, in a Replication Server system, or if the destination database is also a source for other Replication Servers.

Procedure

1. If you have zeroed out the locator for the database, go to the next step. Otherwise, stop Replication Server, then run:

   ```
   1> use <RSSD_name>
   2> go
   1> rs_zeroltm dataserver, <database>
   2> go
   ```

2. Log in to each replicated primary, and replicated RSSD and issue:

   ```
   1> use <database>
   2> go
   ```

   ```
   1> dbcc settrunc ('ltm', 'valid')
   2> go
   ```

3. Restart the Replication Server.
4. If the database is also used as an RSSD, resume the Replication Server connection to the RSSD by issuing the following command to the Replication Server specifying the same string that was specified during the `hibernate_on` command:

   ```
   1> sysadmin hibernate_off, '<Replication Server>'
   2> go
   ```

5. Log in to the Replication Server, and resume the log transfer connection for each replicated primary and each replicated RSSD:

   ```
   1> resume log transfer from <server.database>
   2> go
   ```

   If this is a replicated RSSD, you must log in to the replicate Replication Server.
6. If you are using Rep Agent, log in to the SAP ASE server and restart the Rep Agent:

   ```
   1> use <database>
   2> go
   1> sp_start_rep_agent <database
   >2> go
   ```

7. If you are using the Log Transaction Manager, restart it.

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10.8 Migrate

You can migrate from 32-bit to 64-bit versions on different computers or partitions.

To migrate SAP ASE from the 32-bit to the 64-bit version, first install and configure the 64-bit operating system.

To migrate, you can:

- Use `dump` and `load`.
- Use the `bcp` utility.
- Replace the binary.

10.8.1 Migrating Data Using a Dump-and-Load Method

To perform migrations, back up and restore databases using the `dump` and `load` commands.

Procedure

1. In the 32-bit SAP ASE server, run `dbcc` checks (`checkdb`, `checkalloc`, `checkcatalog`, and `checkstorage`) on all databases in the 32-bit SAP ASE server to ensure they are error free.
2. Create a 64-bit server in a new directory.
3. Create devices and databases to match those in the 32-bit server. Make sure the **`<sysusages>`** mapping is correct.

   > **Note**
   >
   > Allow 10 percent additional space for the `sybsystemprocs` database.

4. Dump the databases from the 32-bit server.
5. Load the databases to the 64-bit server.
6. If you have partitioned tables, update partition statistics.
7. Run `dbcc` checks on the 64-bit server and make sure they run cleanly.

   For information on upgrading compiled objects, see *Finding Compiled Object Errors Before Production* [page 100].

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10.8.2 Using `bcp` to Migrate Data

If you use DDL scripts to create devices, databases, tables, rules, stored procedures, triggers, and views, you can use `bcp` to migrate data from a 32-bit SAP ASE to a 64-bit SAP ASE.

Context

If you:

- Do not have DDL scripts, use the `ddlgen` utility to re-create the schema for the SAP ASE you are about to migrate. See the *Utility Guide*.
- Have DDL scripts to create devices, databases, tables, rules, stored procedures, triggers, and views, you can use `bcp` to move data out of the old database and into the new.

Procedure

1. In the 32-bit SAP ASE, run `dbcc` checks (`checkdb`, `checkalloc`, `checkcatalog`, and `checkstorage`) on all databases in the 32-bit SAP ASE to ensure they are error free.
2. Use `bcp` to extract all the data from all the tables in the databases.
3. Create a new 64-bit SAP ASE in a new directory.
4. Create devices, databases, and tables.
5. Use `bcp` to bulk copy data into tables.
6. Re-create all views, triggers, and stored procedures.
7. Run `dbcc` checks on the 64-bit SAP ASE server and make sure they run cleanly.

10.8.3 Migrating Data by Replacing the Binary

Migrate data from a 32-bit server to a 64-bit server by replacing the binary.

Procedure

1. In the 32-bit SAP ASE, run `dbcc` checks (`checkdb`, `checkalloc`, `checkcatalog`, and `checkstorage`) on all databases in the 32-bit SAP ASE to ensure that they are error free.
2. Copy the files for the 64-bit SAP ASE into a new directory.
3. Shut down the 32-bit server.
4. Copy the `interfaces` file and the configuration file from the 32-bit `$SYBASE` directory to the 64-bit `$SYBASE` directory.

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5. Copy the 32-bit `$SYBASE/$SYBASE_ASE/install/RUN_<server>` file to the equivalent 64-bit `$SYBASE/$SYBASE_ASE/install` directory.
6. Edit the `RUN_server` file to reflect the new location of the `interfaces`, configuration, and log files.
7. Remove all references to the 32-bit `$SYBASE` directories from your **<$PATH>** definition.
8. Change to the 64-bit `$SYBASE` directory and source the `SYBASE.csh` script (C shell).
9. Change to the 64-bit `$SYBASE/$SYBASE_ASE/bin` directory and execute:

   ```
   startserver -f < RUN_server>
   ```
10. After the 64-bit server starts, run `installmaster`, `installmodel`, and `instmsgs.ebf`.
11. If you used `dbccdb` for `dbcc checkstorage`, run `installdbccdb`. This re-creates tables in the `dbccdb`. This may cause you to lose data.
12. Drop and re-create the compiled objects, such as stored procedures, triggers, views, and defaults.
13. If you have partitioned tables, update partition statistics.
14. Run `dbcc` again on all databases to verify that they run cleanly.

10.9 SAP ASE Components and Related Products

After you finish upgrading SAP ASE, upgrade its components and related products.

Refer to *Using Sybase Failover in a High Availability System* for instructions on how to upgrade an SAP ASE configured with high availability.

10.9.1 Upgrading Job Scheduler

After upgrading to a new SAP ASE server, upgrade Job Scheduler.

Context

> **Note**
>
> You must have `$SYBASE/$SYBASE_OCS/bin` directory in `$PATH` so the `isql` executable is accessible. Use `isql` to perform all the steps in this task.

Procedure

1. Copy the directory services entry for JSAGENT (or jsagent) from the old server to the new server.

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2. Make sure the new server is running.
3. Ensure that at least 9000 locks are configured. If the number of locks on the server is fewer than 9000, increase it:

```
1> sp_configure "number of locks", 9000
2> go
```

4. Before you restart the SAP ASE server and run Job Scheduler, run the `installjsdb` script to update Job Scheduler tables and stored procedures:
   a) Disable Job Scheduler:

```
1> sp_configure "enable job scheduler", 0
2> go
1> sybmgmtdb..sp_sjobcontrol @name=NULL, @option="stop_js"
2> go
```

   b) Run the `installjsdb` script:

```
isql -Usa -Psa_password -S<servername>
-i$SYBASE/$SYBASE_ASE/scripts/installjsdb
```

> **Note**
>
> The directory with the `isql` executable (`$SYBASE/$SYBASE_OCS/bin`) must be in your path.

   The `installjsdb` script looks for the `sybmgmtdb` database.
   c) Enable Job Scheduler:

```
 sp_configure "enable job scheduler", 1
```

   d) To start Job Scheduler, either restart the server, or enter:

```
1> use sybmgmtdb
2> go
1> sp_sjobcontrol @name=NULL, @option="start_js"
2> go
```

5. Restart the SAP ASE server if you restarted Job Scheduler manually.
6. (Optional) Add more log space. Some 64-bit platforms require additional space for the `sybmgmtdb` log:

```
1> use master
2> go
1> alter database sybmgmtdb LOG on sybmgmtdev=20
2> go
```

7. To upgrade `sybmgmtdb`, run the `installjsdb` script that is included, saving the output to a file:

```
isql -Usa -P<sa_password> -S<servername> -n -i$SYBASE/$SYBASE_ASE/scripts/
installjsdb
-o<output_file>
```

> **Note**
>
> When upgrading from SAP ASE version 12.5.x to 15.5 and later, increase the size of `sybmgmtdb` from 50MB to at least 160MB. `sybmgmtdb` must have free log space of at least 60MB.

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10.9.1.1 Upgrading Job Scheduler Templates

After upgrading to the new server, upgrade the templates and jobs created by Job Scheduler.

Context

> **Note**
>
> Several changes impact the Job Scheduler templates. These changes make some templates incompatible with earlier versions of the server. The current templates are version 3.0 in the XML files.

Procedure

1. Disable Job Scheduler.
2. Update any environment variables, scripts, or applications that refer to the Job Scheduler directory path. The Job Scheduler directory is under the `ASE-16_0` directory, in `$SYBASE/$SYBASE_ASE/jobscheduler`.

   Directories below `jobscheduler` remain the same.
3. Copy files from the `jobscheduler` directory to the `ASE-16_0` directory. If you are installing the new server directories over the old server directories, the installer automatically moves your files to the new `jobscheduler` directory.
4. If you modified SAP-supplied templates, stored procedures, or XML documents, do not overlay the new templates with your modified versions. If you do, you lose the enhancements provided by the revised templates. Carefully merge your template changes into the SAP template files, or better yet, rename your modified templates.
5. You may need to make minor modifications to jobs you created from 2.0 or earlier templates. In some templates, parameters changed from `varchar(5)` to `int`. The following table lists the templates that changed in version 2.1 and the changes you must make to the SQL code in the jobs created from the templates.

   Table 8: Changed Job Scheduler Templates

Template	Modified Files	Datatype for <parameter> Changed from varchar(5) to int
`dump database`	`jst_dump_databases`	`@use_srvr_name`
`dump database log`	`jst_dump_log`	`@truncate_flag` and `@use_srvr_name`
`update statistics`	`jst_update_statistics`	`@index_flag`
`rebuild indexes`	`jst_reorg_rebuild_indexes`	`@dump_flag`

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Template	Modified Files	Datatype for <parameter> Changed from varchar(5) to int
rebuild table	jst_reorg_rebuild_tables	@dump_flag
reclaim indexes	jst_reclaim_index_spac	@dump_flag
reclaim tables	jst_reclaim_table_space	@resume_flag

6. Some Job Scheduler templates have been modified to support new server functionality. These changes are related to new parameters for specifying a partition name, or a data change value for the new server commands that added these options. If you have jobs created from any of the enhanced templates, modify the SQL of the jobs for the 16.0 servers.

   If you have a job scheduled to run on a pre-16.0 server and you need it to also run on 16.0 servers, leave the existing job alone and create a new job for 15.7 ESD #2 servers, as the job commands are different.

   You need not modify any jobs you run on pre-16.0 servers. The following table lists the templates that changed in version 3.0 and the changes you must make to jobs created from them.

   > **Note**
   >
   > All templates listed below, except `delete statistics`, are incompatible with pre-15.0.1 servers. Do not use them to create jobs that are scheduled on pre-15.0.1 servers; you must use the 2.1 or 2.2 versions for pre-15.0.1 servers.

   Table 9: Modified Job Scheduler Templates

Template	Modified File	Change Description	Job Modifications
delete statistics	jst_delete_statistics	Added @ptn_name as third parameter.	Optional.
update statistics	jst_update_statistics	Added @ptn_name as fifth parameter, @datachg_threshold as the 10th parameter, and added reference.	Required. Include values (or NULL) for new parameters.
rebuild indexes	jst_reorg_rebuild_indexes	Added @ndx_ptn_name as third parameter.	Required. Include value (or NULL) for new parameter.
reclaim indexes	jst_reclaim_index_space	Added @ptn_name as third parameter.	Required. Include value (or NULL) for new parameter.
reclaim tables	jst_reclaim_table_space	Added @ptn_name as second parameter.	Required. Include value (or NULL) for new parameter.
multiple	jst_get_freespace , jst_get_usedspace	Replace reserved_pgs and data_pgs with reserved_pages and data_pages.	No impact on job SQL.

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7. Install the template stored procedures and and move them to the Job Scheduler template stored procedure directory. For example:

   ```
   cd $SYBASE/$SYBASE_ASE/jobscheduler/Templates/sprocs
   ```

   Run the stored procedure installation script for each server being upgraded:

   ```
   installTemplateProcs <<servername>> <<username>> <<password>>
   ```

   > **Note**
   >
   > Upgrade template stored procedures on all Job Scheduler servers and target servers that are upgraded to SAP ASE version 16.0. Do not install them on pre-15.5 servers.

8. Install and move the template XML documents into the JS template XML directory. For example:

   ```
   cd $SYBASE/$SYBASE_ASE/jobscheduler/Templates/xml
   ```

9. Before running the `installTemplateXml` XML installation script, set the SYBASE_ASE_SA_USER environment variable and SYBASE_ASE_SA_PWD variable in the `SYBASE.csh` file before running the XML installation script:
10. Run the XML installation script on 15.0.1 servers with Job Scheduler installed:

    ```
    installTemplateXml <servername> <machinename> <serverport>
        <username> <password> [<language_code>]
    ```

    Use "en" for the **<language_code>** or omit the parameter completely, as "en" is the default.

    > **Note**
    >
    > Upgrade template XML documents on all Job Scheduler servers upgraded to SAP ASE version 15.0.1. Do not install them on pre-15.0.1 servers or servers where Job Scheduler is not installed.

10.9.2 Upgrading High Availability and Cluster Support

Upgrade the cluster subsystem.

Context

SAP ASE 16.0 supports these cluster platforms for high availability:

- HPIA – MCSG 11.18
- IBM AIX – PowerHA 7.1
- Sun Solaris – VCS4.0, SunCluster 3.2
- Linux-AMD – VCS4.1
- Win2008 R2 – Failover Cluster

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There are two ways to upgrade a cluster subsystem:

Procedure

- Perform a major upgrade, which involves cluster downtime, then shut down and restart all servers. You must:
  a) Run `sp_companion suspend`, as described in *Using Sybase Failover in a High Availability System*.
  b) Take offline the resource groups of primary and secondary companions on both nodes. Ensure that the companion server and corresponding resource groups are not automatically brought online until the cluster system upgrade is complete.
  c) Upgrade the cluster subsystem following the instructions from the cluster system vendor. You may find options to migrate the current resource groups to the new cluster version. If such an option is not available (or if the resource groups get deleted or corrupted), re-create the resource groups and configure them appropriately after you have upgraded the cluster system.
  d) Bring the resource groups online. This should bring primary and secondary companions online on their respective nodes.
  e) Run `sp_companion resume` as described in *Using Sybase Failover in a High Availability System*.
- To avoid cluster downtime, perform a minor upgrade. Nodes are failed over to other nodes and upgraded one at a time. For example, assuming ASE1 is the primary companion on node N1, and ASE2 is secondary companion running on node N2:
  a) Upgrade the primary companion:
     1. Relocate the primary resource group to N2 or shut down ASE1. This causes ASE1 to fail over from N1 to N2.
     2. Upgrade the cluster subsystem on N1 following the upgrade instructions provided by the vendor.
     3. Fail back ASE1 from N2 to N1. See the appropriate cluster chapter in *Using Sybase Failover in a High Availability System* for more details on SAP ASE failback.
  b) Upgrade the secondary companion. If you are using a symmetric configuration, follow the steps in "upgrade the primary companion," above, for ASE2.
     If you are using an asymmetric configuration:
     1. Take the secondary resource group offline and verify that ASE2 is shut down. ASE2 is unavailable during this upgrade.
     2. Upgrade the cluster subsystem on N2 following the upgrade instructions from the vendor.
     3. Start ASE2 by bringing the secondary resource group online to N2.

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10.9.3 Upgrading Java in the Database

If Java in the database functionality is currently enabled, you must run the `installpcidb` script, which creates tables and stored procedures in the `sybpcidb` database.

Procedure

1. Use `isql` to run the `installpcidb` script, saving the output to an operating system file.

   ```
   isql -Usa -P<sa_password> -S<server_name>
     -i$SYBASE/$SYBASE_ASE/scripts/installpcidb -o<output_file>
   ```

2. Enable the Java in the database functionality:

   ```
   1> sp_configure 'enable pci', 1
   2> go
   1> sp_configure 'enable java', 1
   2> go
   ```

   You may need to increase `'max memory'` to enable these parameters. Restart the server for changes to take effect. You can configure the maximum size of the PCI bridge memory pool through the `'pci memory size'` configuration parameter. For more information, see *Java in Adaptive Server Enterprise*.

10.9.3.1 Enabling Java in the Database in a High Availability System

You can use the Java in the database feature on a system that also uses high availability.

Context

Drop high availability companionship before installing the `sybpcidb` database, and reestablish companionship afterwards.

Java in the database functionality must be either enabled or disabled on both nodes of the high availability system.

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10.9.4 Upgrading Backup Server

You can upgrade Backup Server at any point after you upgrade SAP ASE using similar steps. XP Server does not have a formal upgrade process.

Procedure

1. If you are:

Option	Description
Upgrading during the initial server installation	Select: ○ *Upgrade Existing Servers* when the installer prompts ○ *Upgrade SAP ASE Server and Backup Servers* This launches the `sqlupgrade` utility. Click *OK*.
Upgrading after the initial installation	Start the `sqlupgrade` utility from the command line. Enter: `$SYBASE/$SYBASE_ASE/bin/sqlupgrade`

2. Perform the upgrade steps as prompted.

10.9.5 Upgrading Databases Using Dump and Load

When you upgrade SAP ASE, you can also upgrade databases and transaction logs from versions of SAP ASE as early as 12.5 using the `dump` and `load` commands.

Context

Some issues of which you should be aware:

- The upgrade process requires space for copying data and logging changes to the system tables. If the source database in the dump was full, the upgrade process might fail. You can use `alter database` to extend the free space in the event of insufficient-space errors.
- After reloading an older dump, run `sp_checkreswords` from the new installation on the loaded database to check for reserved words.

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10.9.6 How Compiled Objects Are Handled When Upgrading SAP ASE

SAP ASE upgrades compiled objects based on their source text.

Compiled objects include:

- Check constraints
- Defaults
- Rules
- Stored procedures (including extended stored procedures)
- Triggers
- Views

The source text for each compiled object is stored in the `syscomments` table, unless it has been manually deleted. The upgrade process verifies the existence of the source text in `syscomments`. However, compiled objects are not actually upgraded until they are invoked.

For example, if you have a user-defined stored procedure named `list_proc`, the presence of its source text is verified when you upgrade. The first time `list_proc` is invoked after the upgrade, SAP ASE detects that the `list_proc` compiled object has not been upgraded. SAP ASE recompiles `list_proc`, based on the source text in `syscomments`. The newly compiled object is then executed.

Upgraded objects retain the same object ID and permissions.

You do not receive any notification if the compiled objects in your database dump are missing source text. After loading a database dump, run `sp_checksource` to verify the existence of the source text for all compiled objects in the database. Then, you can allow the compiled objects to be upgraded as they are executed, or you can run `dbcc upgrade_object` to find potential problems and upgrade objects manually.

Compiled objects for which the source text has been hidden using `sp_hidetext` are upgraded in the same manner as objects for which the source text is not hidden.

For information on `sp_checksource` and `sp_hidetext`, see *Reference Manual: Procedures*.

> **Note**
>
> If you are upgrading from a 32-bit to a 64-bit SAP ASE, the size of each 64-bit compiled object in the `sysprocedures` table in each database increases by approximately 55 percent when the object is upgraded. The preupgrade process calculates the exact size; increase your upgraded database size accordingly.

To determine whether a compiled object has been upgraded when you upgrade to a 64-bit pointer size in the same version, look at the **`<sysprocedures.status>`** column. It contains a hexadecimal bit setting of 0x2 to indicate that the object uses 64-bit pointers. If this bit is not set, it indicates a 32-bit object, which means it has not been upgraded.

To ensure that compiled objects have been upgraded successfully before they are invoked, upgrade them manually using the `dbcc upgrade_object` command.

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Related Information

Postupgrade Tasks [page 83]
Restoring Functionality in SAP ASE After Upgrading [page 84]

10.9.6.1 Finding Compiled Object Errors Before Production

Use `dbcc upgrade_object` to identify potential problem areas that may require manual changes to achieve the correct behavior.

After reviewing the errors and potential problem areas, and fixing those that need to be changed, use `dbcc upgrade_object` to upgrade compiled objects manually instead of waiting for the server to upgrade the objects automatically.

Problem	Description	Solution
Missing, truncated, or corrupted source text	If the source text in `syscomments` has been deleted, truncated, or otherwise corrupted, `dbcc upgrade_object` may report syntax errors.	If: • The source text was not hidden – use `sp_helptext` to verify the completeness of the source text. • Truncation or other corruption has occurred – drop and re-create the compiled object.
Temporary table references	If a compiled object, such as a stored procedure or trigger refers to a temporary table (#temp **<table_name>**) that was created outside the body of the object, the upgrade fails, and `dbcc upgrade_object` returns an error.	Create the temporary table exactly as expected by the compiled object, then execute `dbcc upgrade_object` again. Do not do this if the compiled object is upgraded automatically when it is invoked.
Reserved word errors	If you load a database dump from an earlier version of SAP ASE into version 15.7 or later and the dump contains a stored procedure that uses a word that is now reserved, when you run `dbcc upgrade_object` on that stored procedure, the command returns an error.	Either manually change the object name or use quotes around the object name, and issue the command `set quoted identifiers on`. Then drop and re-create the compiled object.

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10.9.6.1.1 Quoted Identifier Errors

Quoted identifiers are not the same as literals enclosed in double quotes. The latter do not require you to perform any special action before the upgrade.

Context

`dbcc upgrade_object` returns a quoted identifier error if:

- The compiled object was created in a pre-11.9.2 version with quoted identifiers active (`set quoted identifiers on`).
- Quoted identifiers are not active (`set quoted identifiers off`) in the current session.

For compiled objects the upgrade process automatically activates or deactivates quoted identifiers as appropriate.

Procedure

1. Activate quoted identifiers before running `dbcc upgrade_object`.

   When quoted identifiers are active, use single quotes instead of double quotes around quoted `dbcc upgrade_object` keywords.
2. If quoted identifier errors occur, use the `set` command to activate `quoted identifiers`, and then run `dbcc upgrade_object` to upgrade the object.

10.9.6.1.2 Determining Whether to Change `select *` in Views

Determine whether columns have been added to or deleted from the table since the view was created.

Context

Perform these queries when `dbcc upgrade_object` reports the existence of `select *` in a view:

Procedure

1. Compare the output of `syscolumns` for the original view to the output of the table.

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In this example, you have the following statement:

```
create view all_emps as select * from employees
```

> **Caution**
>
> Do not execute a `select *` statement from the view. Doing so upgrades the view and overwrites the information about the original column information in `syscolumns`.

2. Before upgrading the `all_emps` view, use these queries to determine the number of columns in the original view and the number of columns in the updated table:

```
select name from syscolumns
  where id = object_id("all_emps")
select name from syscolumns
  where id = object_id("employees")
```

3. Compare the output of the two queries by running `sp_help` on both the view and the tables that comprise the view.

   This comparison works only for views, not for other compiled objects. To determine whether `select *` statements in other compiled objects need to be revised, review the source text of each compiled object.

   If the table contains more columns than the view, retain the preupgrade results of the `select *` statement. Change the `select *` statement to a `select` statement with specific column names.

4. If the view was created from multiple tables, check the columns in all tables that comprise the view and rewrite the `select` statement if necessary.

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11 Downgrading SAP ASE

You cannot downgrade SAP ASE version 16.0 to an earlier version of SAP ASE.

> **Note**
>
> Do not run the `sp_downgrade` system procedure. The downgrade may appear to work but does not actually occur, and you can neither start the previous version of SAP ASE or load databases you dumped from version 16.0

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12 Troubleshoot the Server

Determine the cause of problems and apply the recommended solution.

To determine the cause of an error, first look in the log file of the utility being used, to identify the task the utility was performing when it failed. Then check the server error log.

This table lists possible causes and solutions for common problems that you might encounter during a first-time installation, or an upgrade. If you continue to have problems, retry the installation or upgrade.

If the installation program or `srvbuild` unexpectedly quits, or if you cannot correct the problem, see the *Error Messages and Troubleshooting Guide*.

Problem	Solution
The installation program cannot start the SAP ASE server.	• Make sure you meet RAM requirements. If you have the required amount of RAM, remove, then reinstall all applications to the hard drive and restart the installation. • After SAP ASE is installed, there should be 25MB of free disk space left in the disk drive. SAP ASE needs approximately 18MB to create shared memory files. • The SAP ASE server may not start if it cannot find a SySAM license or if the grace period has expired. Check the SAP ASE error log for the cause of the license checkout failure and fix the issues.
The installation program cannot connect to the upgraded SAP ASE server.	Verify that the environment variables and password are correct.

12.1 Error Logs for Installation Utilities

The information in the error logs may help determine the reason and possible solutions for problems with installation-related utility programs.

Utility	Default Location and File Name
SAP ASE Installer	`$SYBASE/log/ASE_Suite.log`
srvbuildres	`$SYBASE/$SYBASE_ASE/init/logs/srvbuild`**<MMDD>**`.`**<NNN>** where: • **<MM>** – is the month. • **<DD>** – is the date. • **<NNN>** – is a three-digit number identifying the `srvbuild` session.
sqlupgraderes	• `$SYBASE/$SYBASE_ASE/init/logs/sqlupgradeMMDD.NNN` • `$SYBASE/$SYBASE_ASE/upgrade/upgrade.NNN` – is a temporary file created by the upgrade process.

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12.2 Error Logs for SAP ASE Servers

The information in the error logs may help to determine the reason and possible solution for an error message.

Server	Default Location and File Name
SAP ASE	`$SYBASE/$SYBASE_ASE/install/<servername>.log`
Backup Server	`$SYBASE/$SYBASE_ASE/install/<servername>.log`
XP Server	`$SYBASE/$SYBASE_ASE/install/<servername>.log`

12.3 Troubleshooting Common Installation Problems

Identify the cause of installation problems and apply the recommended solutions.

If your installation fails, review error messages and your SAP ASE error log to determine the cause of the failure.

Problem	Resolution

Cannot use X-Windows.	If the setup and configuration utilities do not show correctly, you may need to adjust the resolution on your monitor.
	To change to a smaller font size, issue the following UNIX commands:
	`% cd $SYBASE/ASE-16_0`
	`% chmod +w xappdefaults`
	`% cd xappdefaults`
	`% chmod +w *`
	`% foreach i(*)`
	`? cat $i | sed -e "s/140/100/g" | sed -e "s/^#D/D/g" | sed -e "s/^#S/S/g" > p`
	`? mv p $i`
	`? end`
	`%`
	The installation utilities will now use approximately 25 percent less window space.

Cannot eject the CD or DVD from the drive.	If you cannot eject the CD from the drive, check: • Whether the disk drive path is the current directory (`pwd`) in a UNIX terminal window. If it is, change (`cd`) to another directory. • For `sybhelp` processes. If these processes exist, kill them using the UNIX `kill` command.
DISPLAY environment variable not set correctly.	The resolution to the DISPLAY variable problem should instruct you to open Exceed (under Hummingbird Connectivity) and set DISPLAY equal to `hostname:<b>`, where `<b>` is the number in the parentheses following Exceed in the Exceed window.

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Problem	Resolution

Client not authorized to connect to server.	This error message means a remote machine does not have permission to display the user interface on the local machine where you start working:
	`Xlib: connection to "host_name" refused by server`
	`Xlib: Client is not authorized to connect to Server`
	`xhost: unable to open display "host_name"`
	To correct the problem:
	1. Enter the following command at the UNIX prompt of your *local* machine, where **<remote_machine>** is the machine on which you are running the installer:
	`xhost +<remote_machine>`
	2. Restart the installer.

Address already in use.	Enter a different port number on the `srvbuild` window. The command `netstat -a` produces a list of port numbers in use.
SAP ASE fails to start.	The shared memory of the operating system may not be set high enough. Adjust the shared memory value. Restart the installation or upgrade process.
The installer fails to start.	Verify that the operating system has all the patches required by the SAP JRE.

Cannot start XP Server.	You may receive the following message from XP Server when it is invoked by `xp_cmdshell` or some other extended stored procedure:
	`Msg 11018, Level 16, State 1:`
	`Procedure "xp_cmdshell", Line 2:`
	`XP Server must be up for ESP to execute.`
	`(return status = -6)`
	Verify that there is an XP Server entry in the SAP ASE `sysservers` table. If you created XP Server in a different `srvbuild` session than SAP ASE and you did not specify a related SAP ASE server, `srvbuild` cannot update the `sysservers` table. Verify that the XP server exists in the interfaces file or LDAP server.
	Use `sp_addserver` to add an entry to the `sysservers` table.

Troubleshooting resource file installations.	If you encounter problems during the build, configuration, or upgrade process while using the `srvbuild[res]`, `sqlloc[res]`, or `sqlupgrade[res]`, it may be that these utilities did not allow enough time for a SAP ASE server to shut down properly. Set the SYBSHUTWAIT environment variable to force the utilities to wait for the SAP ASE server to shut down. For example, this command forces the utility to wait for two minutes before proceeding with the next task: `% setenv SYBSHUTWAIT 120`

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12.3.1 If the Installation Quits While You Are Configuring an SAP ASE Server

Perform specific steps if the installation suddenly quits.

Procedure

1. View the contents of the log file generated by the SAP ASE server.
2. Take any suggested actions to correct the problem. If the installation fails after the installation program:
   - Created any operating system files, such as the master device or system procedures device files, delete those files.
   - Starts the SAP ASE server that you are attempting to install, shut down that server.
3. Use Server Config to restart the configuration.

12.4 Stopping a SAP ASE Server After a Failure

If the installation or upgrade session fails after you start a SAP ASE server for any reason, use the `shutdown` command.

Procedure

1. Log on as "sa".
2. Shut down the SAP ASE server using the `shutdown with nowait` command. This stops the SAP ASE server immediately, without waiting for currently executing SQL statements to finish:

   ```
   1> shutdown with nowait
   2> go
   ```

3. If the installation or upgrade session fails after you start the SAP ASE server, try using SAP Control Center to shut down the server. If SAP Control Center cannot shut down the server, use the `shutdown` command.

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12.5 If SAP ASE Fails the Preupgrade Eligibility Test

Examine the log file to determine why SAP ASE is ineligible for an upgrade.

Context

If SAP ASE fails the preupgrade test, Server Config displays:
Server **<SERVER_NAME>** failed preupgrade eligibility test. See log for more information.

Procedure

1. From the Upgrade window, select *Exit*.
2. Examine the log file in `$SYBASE/$SYBASE_ASE/init/logs`.
   After you resolve any problems, shut down the SAP ASE server and use `sqlupgrade` to complete the upgrade session.

12.6 When an Upgrade Fails

If the upgrade process fails, the installation program displays error messages.

Once you start SAP ASE on the new version, you cannot start SAP ASE on the earlier version. Attempts to do so result in having to restore from backups.

12.6.1 If You Can Identify the Cause of the Upgrade Failure

If the error logs or messages clearly indicate the cause of failure, and you are confident that your databases have not been damaged, you can attempt to fix the problem and immediately re-run the upgrade.

Context

If the upgrade process fails again and you cannot determine the cause of failure, check the error log file to find out when and where the upgrade failed, and contact SAP Product Support.

By default, the log file is located in `$SYBASE/$SYBASE_ASE/install/<`**<servername>**`>log`.

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Procedure

1. Exit the `sqlupgrade` program.
2. Perform the necessary actions to fix the problem.

   For example, if the error log indicates that the upgrade failed because your existing databases do not contain enough space, use the `alter database` command to increase the available space.
3. If needed, shut down the SAP ASE server.

   Shutting down the server enables the installation program to start the server and re-run the upgrade session.
4. Start `sqlupgrade` again.
5. Select *Upgrade SAP ASE*, and proceed with the upgrade.

12.6.2 Restoring Databases After a Failed Upgrade

You may need to restore your databases due to a failed upgrade.

Procedure

- If you think the upgrade failure or its cause may have damaged your databases, restore the databases from backups. For information about restoring databases, see the *System Administration Guide*.
- If you are concerned about the possible corruption of your databases, exit `Server Config`, but do not attempt to restart the upgrade session until you have restored the databases from backup. After restoration is complete, retry the upgrade.

12.6.3 Recovering from a Failed Upgrade

Upgrade issues may be due to a failure to upgrade an individual database, or a failure to complete configuration changes after all databases have been upgraded.

Context

Use the output from the upgrade utility to correct the problem that caused the failure.

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Procedure

- If the upgrade failed because the process ran out of some resource, such as data or log space, locks, or auxiliary scan descriptors, add space to the database using the `alter database` command.

  You may also correct other resource failures by changing the server's configuration using the `sp_configure` stored procedure.
- If an upgrade failure leaves a database offline, and the failure can be corrected only by making data changes in the database, you can gain access to the failed database by using `isql` or a similar program to connect to the affected server as user "sa" and issuing this command:

  ```
  dbcc traceon(990)
  ```

  Having set this trace flag, user "sa" can now use the offline database and make the necessary changes to correct the upgrade failure.

  > **Note**
  >
  > This trace flag grants access only to user "sa"; "sa_role" does not work. If you have disabled the "sa" login, reenable it to get access using this method.

  To restart a server that has not successfully upgraded, use:

  ```
  online database <failed_db_name>
  ```

  The server restarts that database's upgrade from the point of failure.
- If the failure occurs after all databases have been upgraded, or if a failure somehow causes the upgrade utility to fail, manually re-run the utility. After you diagnose and correct the failure, run the upgrade utility:

  ```
  $SYBASE/$SYBASE_ASE/upgrade/upgrade
  ```

  When restarted in this way, the upgrade process says it is "verifying" the upgrade rather than "starting" it, but it makes all the same checks as for the original upgrade.
- To verify that a database has upgraded successfully, check any database's upgrade status using the `online database` command. If any upgrade is required for a database, this command performs it. You may also use a procedure such as this to check all databases at a given installation:

  ```
  declare @dbname varchar(255)
  select @dbname = min(name)
  from master..sysdatabases
  while @dbname is not null
  begin
  online database @dbname
  select @dbname = min(name)
  from master..sysdatabases
  where name > @dbname
  end
  ```
- Reinstall system stored procedures using the scripts from the new version:

  ```
  isql -Usa -P<password> -i $SYBASE/$SYBASE_ASE/scripts/installmaster
  ```


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> **Note**
>
> When a server fails during an upgrade process, it attempts to upgrade the databases when it restarts. When the installation is fully recovered, re-run the upgrade utility to ensure that all postupgrade configuration work is done. Then reinstall the system stored procedures.

- During the upgrade process, the log may become too full due to recorded catalog changes. If so, log in to the new server using `isql`, and issue:

  ```
  isql> dump tran <dbname> with truncate_only
  ```

  a) If `truncate_only` indicates that it cannot truncate the log, retry the command as `no_log` instead.
  b) If this does not truncate the log successfully, use the `alter database` command to extend the database as explained below.
- In some cases, preupgrade space estimations are insufficient for the data copy phase of upgrade. You see a message that there is insufficient space in the system segment for the upgrade. When this happens, the upgrade process stops responding, waiting for space to be provided. To increase the size of the database, log in to the new server using `isql`, and use `alter database`:

  ```
  isql> alter database <dbname> on <device_name> = "<2>m"
  ```

  `alter database` allows you to specify the size to alter the database with the unit specifier "m", or "M".

> **Note**
>
> There are certain upgrade failures from which the server cannot recover. For example, attempts to upgrade system tables to version 15.x are quite sensitive to failures at certain points during the required changes. If you encounter such a failure, restore the failed database from backup. To prevent the upgrade from failing again, correct the problem that caused the original failure before issuing the `online database` command for that database. These catastrophic failures are nearly always caused by running out of resources, as described above, which then causes a failure to undo the aborted transaction.

12.6.4 If You Cannot Identify the Cause of an Upgrade Failure

Your attempts to upgrade may continue to fail.

Procedure

1. If attempts to upgrade continue to fail, check the error log file to identify where and where the upgrade failed.

   By default, the log file is located in `$SYBASE/$SYBASE_ASE/install/<servername>.log`.
2. Contact Product Support with the information.

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13 [conref] ASE Installation Guide

SAP® Adaptive Server® Enterprise is a high-performance relational database management system for mission-critical, data-intensive environments. It ensures highest operational efficiency and throughput on a broad range of platforms.

This installation guide includes information on system requirements, planning the installation, installing ASE, post-installation tasks, upgrades, and downgrades.

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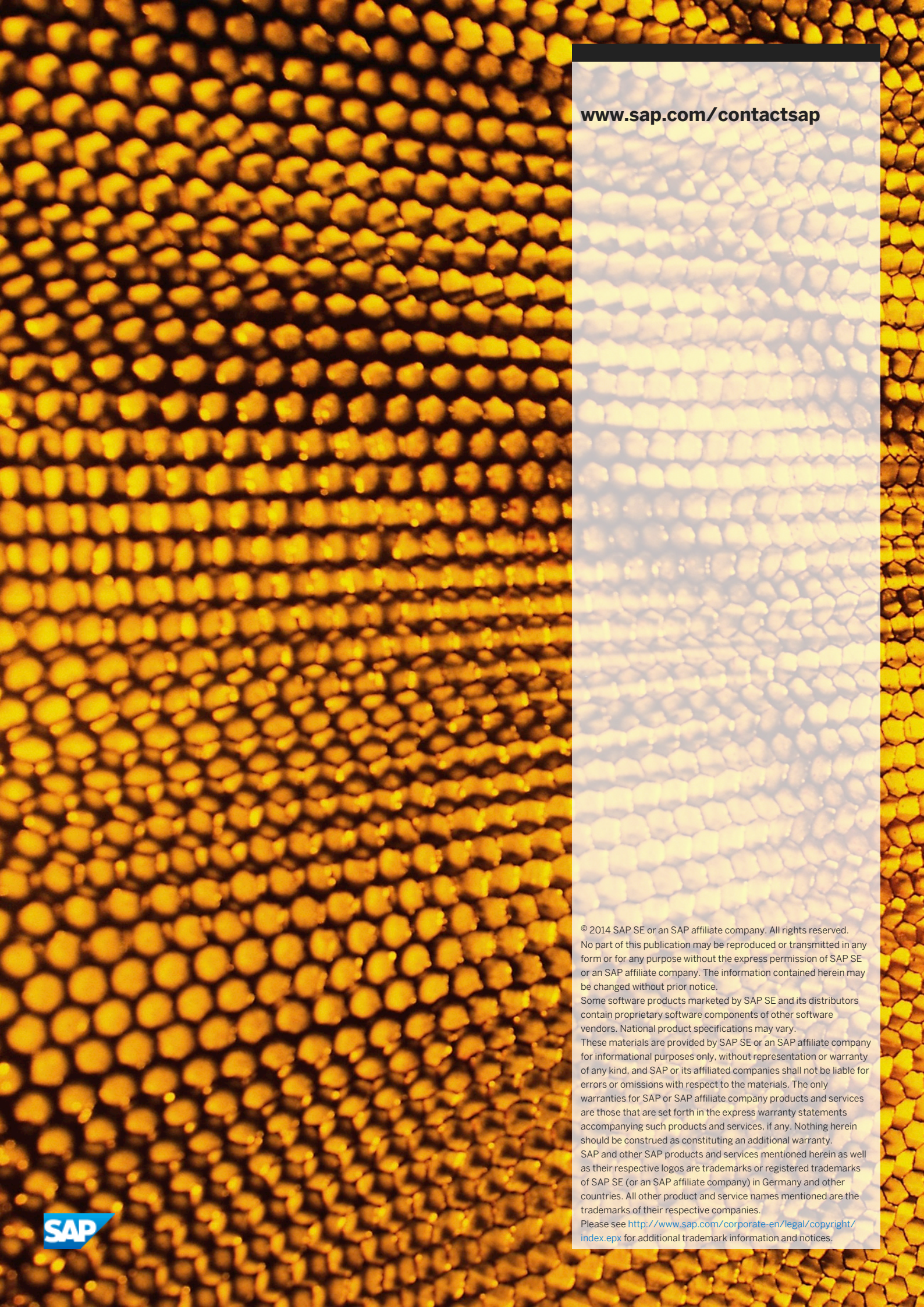

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